PREVENTION OF DISEASE

AND

CARE OF THE SICK

TREASURY DEPARTMENT

UNITED STATES PUBLIC HEALTH SERVICE

1918

TREASURY DEPARTMENT

UNITED STATES PUBLIC HEALTH SERVICE

MISCELLANEOUS PUBLICATION No. 17

PREVENTION OF DISEASE AND CARE OF THE SICK

HOW TO KEEP WELL AND WHAT TO DO IN CASE OF SUDDEN ILLNESS

1918

BY

W. G. STIMPSON, M. D.

Assistant Surgeon General, United States Public Health Service

INCLUDING

FIRST AID TO THE INJURED

BY

M. H. FOSTER, A. M., M. D.

Surgeon, United States Public Health Service

Second Edition

WASHINGTON

GOVERNMENT PRINTING OFFICE

1919

TABLE OF CONTENTS.

	Page.
Prevention of disease	17
Introduction	17
Sanitation of buildings	17
Construction	17
Lighting	20
Ventilation	23
Natural ventilation	26
Dust	27
Heating	28
Water supply	30
The shallow well	34
Deep or artesian wells	35
Driven wells	38
Springs	38
Cisterns	39
Sewage disposal	39
Plumbing	40
Privies	41
Covered can	41
Boxed can	41
L. R. S. privy	41
Disposal of refuse	48
Cleaning	48
Transmission of disease by insects	50
Flies	50
Mosquitoes	54
Fleas	57
Lice	58
Itch-mite (*Sarcoptes scabiei*)	59
Ticks	60
Bedbugs	60
Roaches	61
Sanitation of vessels	61
Construction of vessels	62
Water	63
Mosquitoes	64
Rats	64
Camp sanitation	68
The selection of a camp site	68
Camp structures	69
Mess tent and cook tent	69
Water supply	70
Disinfection of water supplies	70
Sewage disposal	71
Final disposal of contents of can	71
Garbage disposal	71
Suppression of flies	72

	Page.
Personal hygiene	74
Diet	74
Milk	75
Alcoholic liquor	77
Exercise	79
Fatigue	80
Clothing	80
Baths	81
Care of the mouth and teeth	81
Care of the feet	83
Childbirth (labor)	84
Symptoms	84
Care and treatment	85
Care of the baby	87
Care of the sick	102
Nursing	102
Typhoid fever	104
Typhoid prophylaxis	106
Typhus fever	107
Dysentery	108
Pneumonia	110
Influenza	112
Erysipelas (St. Anthony's fire)	112
Diphtheria	113
Rheumatism	115
Acute rheumatism (rheumatic fever)	116
Chronic rheumatism	117
Muscular rheumatism	117
Gonorrheal rheumatism	118
Syphilitic rheumatism	118
Smallpox	118
Vaccination	120
Chicken pox	122
Measles	123
Scarlet fever	125
German measles	127
Whooping cough	127
Mumps	128
Consumption (tuberculosis)	129
Malarial fever	133
Yellow fever	137
Break-bone fever (dengue)	139
Spotted fever (cerebro spinal meningitis)	140
Cholera (epidemic cholera, Asiatic cholera)	141
Plague	144
Beriberi	146
Scurvy	147
Tapeworms	147
Beef tapeworm (*Tænia saginata*)	148
Pork tapeworm (*Tænia solium*)	148
Roundworms	149
Roundworm (*Ascaris lumbricoides*)	149
Seatworm (*Oxyuris vermicularis*)	150
Hookworm (*Nercator americanus*)	150

Care of the sick—Continued. Page.
Syphilis.......... 151
Soft chancre (chancroid).......... 153
Gonorrhea (clap).......... 154
Stricture of the urethra.......... 156
Coughs and colds.......... 157
Croup.......... 158
Broncho-pneumonia.......... 159
Pleurisy.......... 160
Heart disease.......... 160
Palpitation.......... 161
Breast pang (angina pectoris).......... 161
Fainting.......... 161
Sore mouth.......... 162
Sore throat (tonsillitis, quinsy).......... 163
Dyspepsia.......... 164
Diarrhea.......... 166
Cholera morbus (sporadic cholera).......... 166
Colic.......... 167
Appendicitis.......... 169
Piles.......... 169
Kidney disease (nephritis).......... 170
Acute nephritis.......... 170
Chronic nephritis.......... 170
Delirium tremens.......... 171
Sunstroke.......... 172
Heat cramps.......... 173
Headache.......... 174
Convulsions.......... 174
Poison ivy.......... 175
Boils.......... 175
Abscess.......... 176
Sore eyes.......... 177
Conjunctivitis.......... 177
Iritis.......... 177
Preventable blindness.......... 177
Trachoma.......... 178
Earache.......... 179
Accumulation of wax in ears.......... 180
First aid to the injured.......... 181
Wounds.......... 181
Description.......... 181
The cause of inflamed wounds.......... 181
Description of germs.......... 182
Varieties of wounds.......... 183
Incised wounds.......... 183
Lacerated wounds.......... 183
Punctured wounds.......... 183
Symptoms of wounds.......... 184
General principles of the treatment of wounds.......... 184
Infected wounds.......... 184
Sterilization.......... 184
Preparation or sterilization of the hands.......... 184
Sterile dressings.......... 185
Germicides and antiseptics.......... 186
Boric acid.......... 187

First aid to the injured—Continued.
Wounds—Continued. Page.
Disinfection of wounds.... 187
Wounds which are soiled with dirt, sand, or foreign bodies.... 188
Hydrogen peroxide.... 189
Dressing and treatment of wounds.... 189
Dressing of wounds.... 189
First-aid packets.... 190
Further treatment of wounds.... 191
Small cuts.... 191
Large cuts.... 191
First-aid treatment.... 191
Treatment when no doctor will be available.... 191
Lacerated wounds.... 191
First-aid treatment.... 191
After treatment.... 192
The Carrel-Dakin solution.... 192
Punctured wounds.... 193
Treatment.... 193
Sewing up a wound.... 193
Inflamed wounds.... 194
Symptoms.... 194
Treatment.... 195
Inflamed wound of the hand.... 195
Inflamed leg ulcers.... 196
Treatment.... 196
Tetanus or lockjaw.... 196
Description.... 196
Symptoms.... 196
Treatment.... 197
Special wounds.... 197
Abrasions.... 197
Symptoms.... 197
Treatment.... 197
Brush burn.... 197
Treatment.... 198
Splinters.... 198
Wounds caused by fishhooks.... 198
Bullet wounds.... 198
First-aid treatment.... 198
After treatment.... 198
Perforating wounds of the chest.... 198
Symptoms.... 199
First-aid treatment.... 199
After treatment.... 199
Scalp wounds.... 199
First-aid treatment.... 199
After treatment.... 199
Wounds of the abdomen.... 199
First-aid treatment of wounds of the abdomen with escape of the bowels.... 200
After treatment.... 200
Poisoned wounds.... 200
Description.... 200

First aid to the injured—Continued.
Special wounds—Continued. Page.
Snake bites (after Da Costa) 200
Description 200
Symptoms 201
Treatment 201
Insect stings 202
Bee sting 202
Treatment 202
Stings of centipedes, tarantulas and scorpions 202
Treatment 202
Dog bites 202
Treatment of dog bites 202
Symptoms of hydrophobia or rabies in a dog 203
Bites of cats and other small animals 204
Mosquito and flea bites 204
Treatment 204
Hemorrhage or bleeding 204
The circulatory system 204
Ordinary bleeding 205
Oozing 206
Venous hemorrhage 206
Bleeding from varicose veins of the leg 206
Packing a wound to check hemorrhage 206
Rules for packing wounds 207
Preparation for packing a wound 207
Method of packing 207
Emergency packing 208
Arterial hemorrhage 208
Treatment 208
Tourniquets 208
Provisional tourniquets 210
Method of applying tourniquets to main arteries 211
Tying arteries 213
Method of tying arteries 213
After treatment of severe hemorrhage in general 215
Bleeding from special parts 215
Hemorrhage from the scalp 215
Hemorrhage from the face and forehead 215
Hemorrhage from the neck 216
After treatment 216
Hemorrhage from the trunk 217
Hemorrhage from the palm of the hand 217
Hemorrhage from the nose 217
Hemorrhage from a tooth socket 218
Hemorrhage from the lungs 218
Description 218
Treatment 218
Hemorrhage from the stomach 218
Description 218
Treatment 218
Hemorrhage from piles 218
Hemorrhage into the abdomen 219
Symptoms 219
First-aid treatment 219
After treatment 219
Summary of the treatment of hemorrhage 219

First aid to the injured—Continued. Page.
Shock ... 220
Symptoms of shock ... 220
Treatment ... 220
Bandages and bandaging ... 222
Roller bandage ... 222
Method of applying roller bandages ... 222
The spiral reversed bandage ... 223
Figure-of-eight bandage ... 223
The recurrent bandage ... 225
The triangular bandage ... 227
The many-tailed bandage ... 229
The four-tailed bandage ... 229
The T bandage ... 230
Improvised bandages ... 230
Plasters ... 232
Miscellaneous minor injuries and hernia ... 233
Bruise ... 233
Description ... 233
Symptoms ... 233
Treatment ... 233
Black eye ... 233
Bruises with wounds of the skin ... 234
Strains ... 234
Description ... 234
Symptoms ... 234
Treatment ... 234
Strained or lame back ... 234
Symptoms ... 234
Treatment ... 234
Foreign bodies in the eye ... 235
Treatment ... 235
Removal of foreign bodies which are lodged on the cornea or sight of the eye ... 235
Dropping medicine in the eye ... 236
Foreign bodies in the nose ... 236
Foreign bodies in the ear ... 237
Foreign bodies in the throat ... 237
Foreign bodies in the pharynx ... 237
Treatment ... 237
Foreign bodies in the gullet ... 237
Treatment ... 238
Foreign bodies in the larynx ... 238
Treatment ... 238
Rupture or hernia ... 238
Symptoms ... 238
Strangulated hernia ... 239
Symptoms ... 239
Treatment ... 239
Prevention of strangulated hernia ... 239
Injuries to joints ... 240
Joints ... 240
Description ... 240

First aid to the injured—Continued.
Injuries to joints—Continued. Page.
Sprains 240
Description 240
Symptoms 240
Treatment 240
Dislocations 241
Description 241
Causes 241
Symptoms 241
First-aid treatment 242
Dislocation of the fingers 242
Treatment 242
Dislocation of the lower jaw 242
Treatment 242
Dislocation of the shoulder 242
Symptoms 242
Treatment 243
Method of reduction 243
Dislocation of collar bone or clavicle 243
Symptoms 243
First-aid treatment 244
After treatment 244
All other dislocations 244
Fractures 245
Varieties of fractures 245
Symptoms of fracture 246
Simple fracture 246
Crepitus or grating 246
Impacted fractures 246
X-rays 247
First-aid treatment of simple fracture 247
Applying splints 248
Permanent splints 248
Plaster of Paris casts 250
Setting a bone 250
Treatment of simple fractures of special parts 251
Fracture of the fingers 251
Symptoms 251
First-aid treatment 251
After treatment 251
Fracture of the bones of the hand 251
Symptoms 251
First-aid treatment 251
After treatment 251
Fracture of the wrist 252
Symptoms 252
First-aid treatment 252
After treatment 252
Fractures of forearm 252
Symptoms of fracture of both bones of the forearm 253
First-aid treatment 253
After treatment 253
Fractures around the elbow joint 253

First aid to the injured—Continued.
Fractures—Continued.
Symptoms of fracture—Continued.
Treatment of simple fractures—Continued. Page.
Fractures of the arm 254
Symptoms 254
First-aid treatment 254
After treatment 255
Fracture of the skull 255
Fractures of the base of the skull 255
Symptoms 255
First-aid treatment 256
After treatment 256
Fracture of the nose 256
Symptoms 256
First-aid treatment 256
Fracture of the lower jaw 256
Symptoms 256
First-aid treatment 256
After treatment 257
Fracture of the collar bone 257
Symptoms 257
First-aid treatment 257
After treatment 257
Fracture of the ribs 257
Symptoms 258
First-aid treatment 258
After treatment 258
Broken neck or back 258
Symptoms 258
First-aid treatment 258
Method of changing or placing a sheet under a very sick or injured person 259
After treatment 259
Fractures of the lower extremities 259
Fracture of the thigh bone 260
Symptoms 260
First-aid treatment 260
After treatment 260
Note 264
Fracture of the knee cap 264
Symptoms 264
Treatment 264
After treatment 264
Fracture of the bones of the leg 265
Fractures of both bones of the leg 265
Symptoms 265
First-aid treatment 265
After treatment 265
Pott's fracture 266
Symptoms 266
First-aid treatment 266
After treatment 266

First aid to the injured—Continued.
Fractures—Continued.
Symptoms of fracture—Continued. Page.
Fractures of the bones of the foot ... 267
Symptoms ... 267
First-aid treatment ... 267
After treatment ... 267
Fractures of the toes ... 267
First-aid treatment ... 267
After treatment ... 267
Compound fractures ... 267
Symptoms ... 267
First-aid treatment ... 267
After treatment ... 268
Effects of heat and cold ... 269
Sunburn ... 269
Treatment ... 269
Burns and scalds ... 269
Description ... 269
Treatment ... 270
Severe extensive burns ... 271
First-aid treatment ... 271
After treatment ... 271
Burns from chemicals, such as strong acids or alkalies ... 272
Burns from carbolic acid ... 273
Burns of the eye by chemicals ... 273
Electric burns ... 263
Treatment ... 273
Sunstroke and heat exhaustion ... 273
Effects of cold—frostbite ... 274
Symptoms ... 274
Prevention ... 274
Treatment ... 275
Suffocation ... 276
Respiration ... 276
Respiratory system ... 276
Method of performing artificial respiration ... 276
The Schaefer method ... 277
Causes of suffocation ... 278
Symptoms of suffocation ... 278
Drowning ... 279
Prevention ... 279
Rescue of drowning persons ... 279
Instructions for saving drowning persons by swimming to their relief 279
Electric shock ... 282
Prevention ... 282
Symptoms ... 282
Treatment ... 282
Gas poisoning ... 284
Prevention ... 284
Symptoms of illuminating gas suffocation ... 285
Treatment ... 285

First aid to the injured—Continued. Page.
Strangulation and hanging........ 285
Treatment........ 285
Unconsciousness........ 285
Description........ 285
Causes of unconsciousness........ 286
General rules for the examination of unconscious persons........ 286
Fainting........ 287
Symptoms........ 287
Treatment........ 287
Acute alcoholism........ 287
Symptoms of acute alcoholism........ 288
Treatment of acute alcoholism........ 288
Fits........ 288
Treatment of the convulsion........ 289
Brain injuries........ 289
Concussion........ 289
Symptoms........ 289
Treatment........ 289
Compression of the brain........ 289
Symptoms........ 289
Apoplexy........ 290
Symptoms........ 290
Wounds of the brain........ 290
Symptoms........ 290
Treatment........ 290
After treatment........ 290
Sunstroke and heat exhaustion........ 291
Poisoning........ 291
General comments........ 291
General treatment of all poisoning........ 291
Emetics........ 292
Special poisons........ 292
Carbolic acid........ 292
Symptoms........ 292
Treatment........ 293
Bichloride of mercury or corrosive sublimate........ 293
Symptoms........ 293
Treatment........ 293
Opium, laudanum, morphine, and heroin........ 294
Symptoms........ 294
Treatment........ 294
Strong acids, such as muriatic acid, nitric acid, or sulphuric acid. 294
Symptoms........ 294
Treatment........ 294
Lye, ammonia water, or other strong alkalies........ 294
Symptoms........ 294
Treatment........ 294
Tincture of iodine........ 295
Symptoms........ 295
Treatment........ 295
Arsenic........ 295
Symptoms of arsenical poisoning........ 295
First-aid treatment........ 295

First aid to the injured—Continued.
Poisoning—Continued.
Special poisons—Continued. Page.
Strychnine 296
Symptoms of strychnine poisoning 296
First-aid treatment 296
Ptomaine poisoning 296
Symptoms 296
Treatment 296
Mushroom poisoning 297
Symptoms 297
Treatment 297
General directions for aiding the injured 297
General rules as to what to do in case of accident 298
Transportation of the injured 301
Methods of carrying an unconscious person by one operator 304
List of remedies mentioned in this book and their uses 307
List of medical and surgical supplies for medicine chest 312

PREFACE TO FIRST EDITION.

This book has been prepared for the use of the layman in order that he may know what measures he should take to protect himself from disease and what he should do in case of sudden illness, where it is difficult or impossible to secure the services of a physician. Written directions very imperfectly supply the place of the physician and surgeon. No one should depend, if it can be avoided, upon the information that can be obtained from a medical handbook. When there is sickness always send for a physician, if one is within reach, in order that the patient may receive the best attention available.

A supplement on first aid to the injured has been added to the book in order that it may be of use in case of accident, and so that means may be employed to make the injured person as comfortable as possible. The works of Anders, Osler, Rosenau, Harrington, Thompson, Keefer, Gatewood, and other authorities have been freely drawn upon, and the author wishes to acknowledge his indebtedness to them and to the officers of the Public Health Service for the valuable assistance given in the preparation of this book. While most of the articles on disease are new, parts of some of them have been taken from the Handbook of the Ship's Medicine Chest, prepared in 1904 by Surgeon George W. Stoner, and from the revised edition of this book, published in 1915 for the use of the United States Lighthouse Service.

W. G. Stimpson.

July 20, 1917.

PREFACE TO FIRST AID TO THE INJURED.

In addition to strictly first-aid measures, in many instances brief notes on after treatment have been added in the hope of making this publication more useful to the masters of vessels, lighthouse keepers, and others, who by force of circumstances are sometimes compelled to undertake the treatment of injuries without the expectation of medical aid.

In preparing this manual, numerous surgical authorities have been consulted, but special mention should be made of Da Costa's Modern Surgery, and Scudder's Fractures and Dislocations, from which sources much valuable material and many illustrations have been taken, and for which due acknowledgment is gratefully made.

M. H. Foster.

May 15, 1918.

PREVENTION OF DISEASE.

INTRODUCTION.

Sickness causes loss of time, great expense, much suffering, and, frequently, death. When the misery and distress produced by it are taken into account, the importance of its prevention can not be overestimated. It may often be easily avoided by simple means. Scurvy, which was once the scourge of the seas, now rarely occurs on vessels. This is due to the addition of fresh fruits, vegetables, or lime juice to the seaman's ration. Necrosis of the jaw, or phossy jaw, which was formerly so common among workmen in match factories, is now prevented by the use of red phosphorus instead of white phosphorus in this industry. Yellow fever has been stamped out of many places by killing the mosquitoes which convey the disease.

To protect ourselves against disease, it is necessary to know what agencies are harmful to the human body and what measures should be taken to protect the body from them. It has been ascertained, for instance, that in order to keep well, the temperature and humidity of the air in buildings must be regulated; sewage must be disposed of in such a manner as not to contaminate the water supply or pollute the soil; the body must be protected from the bites of insects which spread disease; and precautions must be taken to prevent the transmission of disease from one person to another. It will thus be readily seen that freedom from disease depends upon conditions intimately associated with the body and its environment.

SANITATION OF BUILDINGS.

Construction.

Buildings should not be placed upon made land on account of the organic matter which such land is liable to contain. Clays, alluvial soils, and badly drained places should be avoided, if possible. The best sites are those where the ground is composed of gravels, sand, or where it is underlaid by granite, limestone, or other rock. The building should be surrounded on all sides by an open space, if possible. It should have a cellar underneath with a cement floor. The walls of the cellar should extend several feet above the surface of the ground

and should have damp-proof wall courses. (Fig. 1.) The spaces between the floor joists where they rest upon the foundation should be filled in, or the joists should be embedded in the foundation wall, so that there will be no opening for rats to reach the space between the plaster and the outside sheathing and climb up into the house. The cellar should have small windows on all sides to give light and ventilation. If there is no cellar, the building should be placed upon piers made of wood, brick, stone, or concrete, to provide free circulation of air under the building. The space between the piers should not be inclosed with lattice work, but should be left open in order that the area beneath the house may not become a hiding place for rats or other small animals. Neither the cellar nor the place underneath the house should be used for the storage of lumber, empty barrels, boxes, old furniture, or rubbish of any description, as rats are liable to breed in such places and become a menace to the health of the people living in the house. Roof gutters should be put on the house with sufficient slope to prevent water standing in them, for such water may be used by mosquitoes as breeding places and cause much annoyance and sickness to the inmates of the house. Windows should be placed so as to give plenty of light in each room. The area of window space to floor space should not be less than 1:10, but a ratio of 1:6 is more desirable. As an illustration, a room measuring 18 by 24 feet, making a floor area of 432 square feet, should contain four windows measuring 3 by 6 feet, a total window area of 72 square feet. Two small windows are better than one large window if it is possible to place each on a different side of the room, as a freer circulation of air can then be obtained through the room.

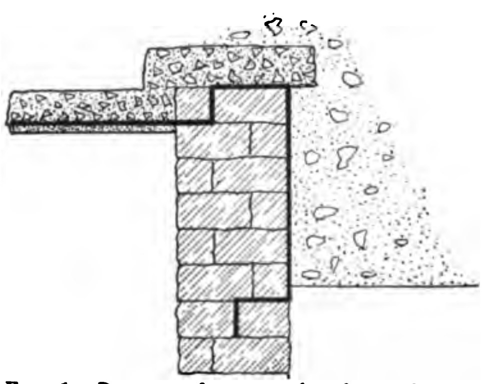


FIG. 1.—Damp-proof course for foundations of buildings (indicated by the heavy line)—Keeler.

All openings in the house should be screened to keep out rats, flies, and mosquitoes. Surgeon von Ezdorf gives the following directions for screening a building:

To be of proper construction, a doorframe should be made of cypress or other seasoned wood 1 inch to 1½ inches thick, well braced and painted. The wire should be of 16 or 18 mesh. The lower panel should be covered on the inner side with a one-fourth inch mesh wire guard to protect the screening. If this is not provided, two or three strips of wood 1 inch wide, set 3 inches apart, should be nailed across the lower panel and two or three such strips of

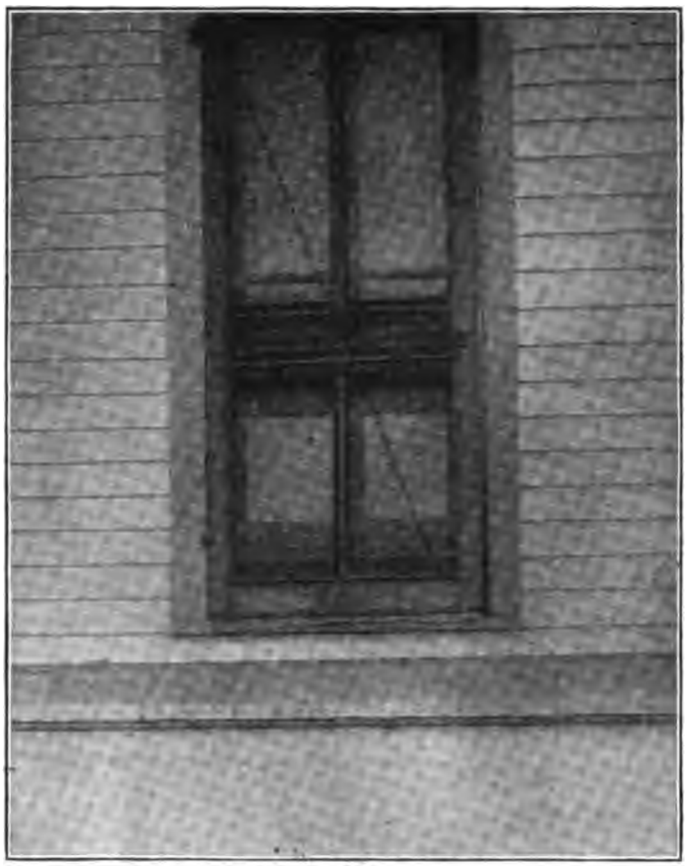


FIG. 2.—Screen door closed; canvas on lower end of door. Cross strips and a diagonal brace prevent the screen door from sagging.

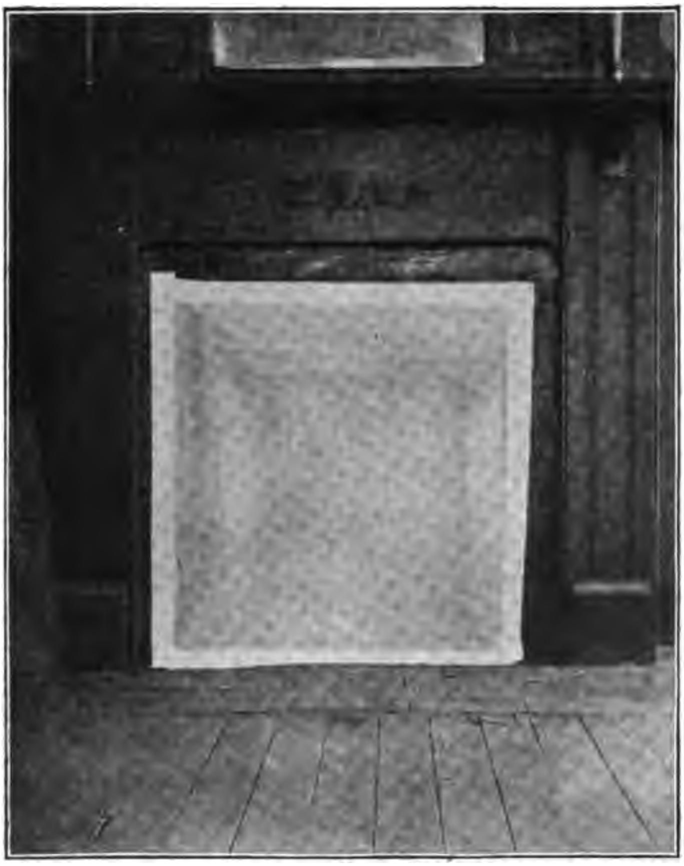


Fig. 3.—Fireplace properly sealed against mosquitoes, covered with unbleached muslin and fixed into place by adhesive plaster.

Fig. 4.—Windows must be screened outside the sash.

wood placed over the lower portion of the top panel. This provision is made for the protection of the screening in pushing the door open.

It is not an unusual experience in certain climates to have doors, even the best, swell or warp, so that they will not close, and after planing them so that they will close the wood will shrink in warm weather, leaving a crack one-half inch or more, where mosquitoes might enter.

An easy fitting door, fully one-fourth inch clear all around the edge, is best, and to make it mosquito proof it will be necessary only to tack a strip of light canvas 1 inch wide around the top and one side of the door facing on the outer side (not on the screen door), so that when the door closes this canvas will take up all the lost or extra space. To the lower edge, on the outer side of the door, a strip of canvas may be tacked to cover any opening existing. This measure is not ornamental, but it is effective.

Some use strips of wood nailed to the inner side of the door jambs against which the door strikes. This is usually satisfactory, but doors will warp lengthwise, so that the top and bottom will not strike such facing strips, and thus leave spaces at the top and bottom. The canvas strips suggested have been found to be more generally satisfactory to meet this defect.

Where mosquitoes are in great abundance, the construction of a screened vestibule with two entrance doors often becomes necessary.

The defects most commonly observed in screen doors are that they do not fit, and that they are made of very thin and unseasoned wood frames and of coarse (12 mesh) wire netting.

There are on the market ready-made door and window screens made of three-fourths inch wood framing and finished with 12 and 14 mesh wire. These are, to say the least, very poor investments, and within a few weeks after use are often next to useless for the purpose intended.

All doors should be made to open outward and have springs which will keep them closed firmly.

A window is probably the most common place of entrance for mosquitoes. Windows are frequently screened with a view to easy removal of the screen and for the easy opening and closing of shutters. For this reason the telescoping and adjustable screens are most commonly used and sold. This type of screen is made of wood or agle-iron material for the frames and furnished with 12 or 14 mesh iron wire. At best, these screens are not effective, as mosquitoes will work their way between the lapping ends. The halfway or half-window sliding screens provided with guides, well made, are efficient but costly. When using this type, the window must be kept wide open so that the sash will fit close to the frame of the screen.

The most efficient method of screening a window is to screen the entire opening. A well-fitting screen frame which is screwed into place so that it can be removed at the end of the season is probably the best.

Another method, less expensive than that of constructing a frame, is to cover the window with wire netting tacked to the window facing and cover the edges with narrow strips of wood nailed down to keep the wire netting flat against the woodwork and hold it firmly in place. Cotton mosquito netting, which will serve for a period of time and possibly for the entire season, provided care is taken with it, might be used in this way.

Where shutters or outer blinds are also used, a tight-fitting frame may be employed, with the lower end of the frame material arranged with a trapdoor covered with canvas, or the frame may be made to extend within 4 to 6 inches of the sill and the remainder closed in with a board on hinges or heavy canvas covering.

Other places to be absolutely screened are the fireplaces, openings into chimneys for stove pipes, drain holes, ice-box drips through floors, and the like.

The chimneys above the fireplaces must not merely be stuffed with newspapers and sacking, but should be absolutely closed with cotton material or netting.

The complaint is often made that a great deal of money is spent in screening a house and that it has proved useless, and, upon questioning or examining such a place we find that the occupant has failed to tightly screen the fireplaces, not knowing that mosquitoes will enter through the chimney.

The fireplaces should therefore be completely sealed. If there is a metal cover or fireboard used to close the fireplace during the summer, then this should have the openings along the edges completely closed by pasting paper over them, or adhesive plaster might be used.

A piece of unbleached sheeting or heavy paper may be used to close the opening. This is to be tacked into place and laths are to be used to hold the edges firm. The paper might be pasted.

If the fireplace is constructed of iron, brick, tile, stone, or other material not permitting the use of nails or tacks, adhesive plaster 2 inches wide may be employed, one half of the width being used to hold the edge of the cotton material, the other half to fasten it in place. The hearth is usually of stone or brick so that adhesive plaster will be serviceable in any case.

If the porches are screened, the holes at the bottom for draining off water should also be screened. Every precaution must be taken to close all openings securely. If the house is not of tight construction, it may require papering of the interior of the rooms.

The walks around the building should be made of brick or cement, or, if this is too expensive, of gravel and cinders. Planks should not be used for this purpose as the spaces under the planks offer easy access to rats and form a convenient harboring place. The keeping of chickens should not be allowed in cities or villages, but if so kept the chicken yard should be protected from rats by a wall of concrete 1 foot high extending 2 feet downward into the ground. The yard should be surrounded by wire fencing about 6 feet high of mesh not larger than a half inch. The door leading into the inclosure should be closed when not in use. Chickens may be allowed to roam at will, but should be fed only in this rat-proof yard.

Small stables should have an elevation of 2 feet, with pier underpinning, and the floor should be tight to prevent grain falling through it. Large stables should have concrete flooring placed flat on the ground with a concrete wall surrounding. The wall should extend at least 1 foot above the surface of the ground and 2 feet below it. Windows and doors should be screened, and all grain should be kept in metal-lined containers.

Lighting.

Natural illumination is that provided by the direct rays of the sun or light reflected by the sky. In factories, workshops, and other places in cities where daylight illumination is reduced by the walls

of neighboring buildings, an increased illumination may be obtained by the use of ribbed glass which causes a larger portion of the light to be refracted into the building. (Fig. 5.) Windows should always be kept clean, as the amount of light entering the room may be reduced 40 per cent by dirt upon the glass.

Artificial illumination is that which must be provided at night or when daylight illumination is insufficient. The source of the light may be from the burning of hard fats as in candles, mineral oils as in lamps, illuminating gas, or electricity. A spermaceti candle

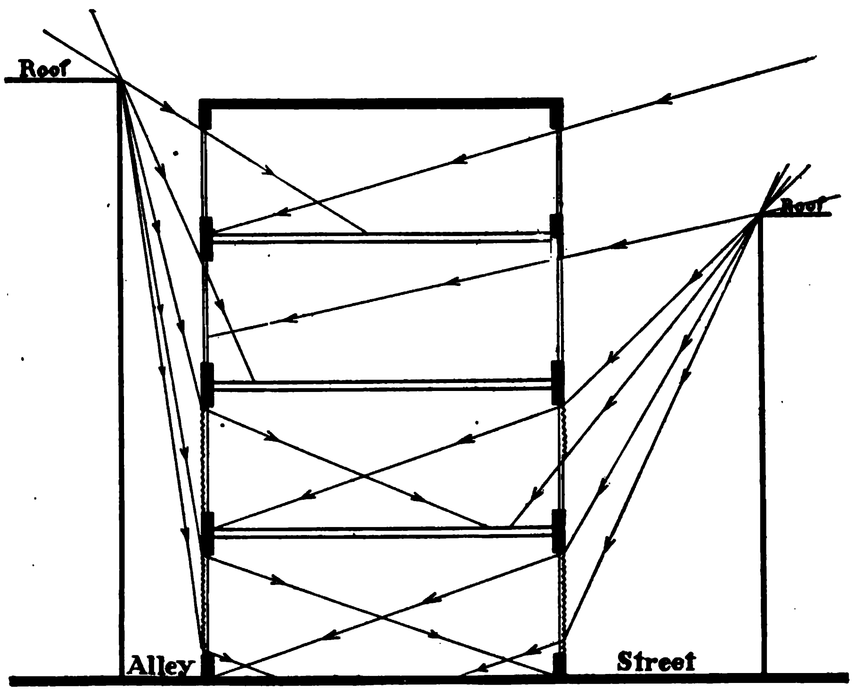


FIG. 5.—Typical relation of loft buildings in the Women's Garment Industries, New York City, to the sky and adjacent structures. The two lower sections show the action of prismatic glass in refracting the rays of light into the room.

burning two grains a minute is used as the standard for measuring artificial illumination; a foot candle is the lighting effect produced upon an object by a standard candle at a distance of 1 foot; at 2 feet, the effect would be not one-half foot candle, but one-fourth foot candle, etc. A lamp which would give off 16 candlepower uniformly in all directions would produce a uniform illumination of 1 foot candle at a distance of 4 feet in any direction. Lamps should be kept scrupulously clean, should be filled and have their wicks carefully trimmed each day, as otherwise they will emit a disagreeable odor.

Illuminating gas may be either coal gas, water gas, or natural gas. Coal gas is produced by heating coal in closed chambers and the gases thus obtained, after being freed from certain impurities, are stored and distributed as needed through pipes to buildings for lighting and cooking purposes. Water gas is made from coke or anthracite coal, steam, and petroleum. The poisonous properties of both coal gas and water gas are due to carbon monoxide, a gas known to miners as "white damp." Water gas contains 35 per cent carbon monoxide, coal gas from 6 to 7 per cent, and natural gas only 0.21 per cent. Illuminating gas (except natural gas) as now used in cities is a mixture of coal gas and water gas, most municipalities limiting by ordinance the amount of water gas in the mixture to 10 per cent.

The symptoms caused by *poisoning from illuminating gas* may be either acute or chronic. In acute poisoning they are violent headache, vertigo, shortness of breath, weakness of the legs, convulsions, and unconsciousness. The carbon monoxide unites with the coloring matter of the blood and prevents it from taking oxygen to the tissues. The danger of breathing this gas in small quantities is that a condition develops in which the patient is dull and listless, can not sleep at night, his gait is slow, and his memory bad. Some of the symptoms of acute poisoning may also be present.

As 0.4 per cent of carbon monoxide in the air will produce fatal results, the necessity for exercising care in the use of illuminating gas is evident. Gas pipes and street mains should be tight so that none of the gas can leak into rooms and produce poisoning. Gas jets should not be left burning where a gust of air may blow them out and let the gas escape into the room.

The *treatment* in acute cases of carbon monoxide poisoning consists of loosening the clothing about the neck and chest, performing artificial respiration (p. 276), and oxygen should be given by inhalation. If the patient is conscious and able to swallow, hot coffee or tea should be administered. Dr. W. G. Fralick, of 33 East Sixtieth Street, New York City, has had great success in the department of charities hospitals and other hospitals in New York treating these cases by an intravenous isotonic solution of sodium hypochlorite used in strength of $\frac{1}{10}$ to 1 per cent, in quantities of 500 to 1,000 c.c., repeated, if necessary, in four hours. The hypochlorite solution destroys the carbon monoxide hemoglobin by oxidation and sets the hemoglobin free so that it can again take oxygen to the tissues.

Electricity is used to supply light by the direct method, where the light is refracted directly downward; the semi-indirect, where a part of the light passes through a frosted bowl and the rest is thrown upon the ceiling and reflected therefrom over the room; and the indirect method, in which the bulbs are contained in an opaque bowl and all the light received in the room is reflected from

FIG. 6.—Illumination of pressing tables, shop No. 12. Gas arc in clear globe and low suspended fishtail burners produce glare effects.

FIG. 7.—Pressing table, shop No. 11, with opal extensive bowl type reflectors, 250-watt tungsten lamps. The illumination was good. The lamps are well out of the visual field of the worker.

FIG. 9.—Humidifier.

FIG. 10.—Window ventilator.

FIG. 11.—Bacteria given off by patient in sneezing. Tuberculosis often spreads through germs given off in sneezing.

FIG. 12.—Showing method of using pot and pan in fumigating with sulphur.

FIG. 30.—Dustless furniture duster.

FIG. 31.—Dustless floor and wall duster. Fitted with two-section handle. Attached section, 12 inches in length. Detached section, 50 inches in length.

the ceiling. The amount of light which should be supplied for general illumination naturally varies with conditions. The following table taken from the transactions of the Illuminating Engineering Society gives the minimum permissible and the desirable intensities which should be maintained:

	Foot candles at the work.	
	Ordinary practice.	Minimum.
(a) Roadways and yard thoroughfares	0.05- 0.25	0.02
(b) Storage spaces	.50- 1.00	.25
(c) Stairways, passageways, aisles	.75- 2.00	.25
(d) Rough manufacturing such as rough machining, rough assembling, rough bench work	2.00- 4.00	1.25
(e) Rough manufacturing, involving closer discrimination of detail	3.00- 6.00	2.00
(f) Fine manufacturing, such as fine lathe work, pattern and tool making, light, colored textiles	4.00- 8.00	3.00
(g) Special cases of fine work, such as watchmaking, engraving, drafting, dark-colored textiles	10.00-15.00	5.00
(h) Office work such as accounting, typewriting, etc	4.00- 8.00	3.00

With modern illuminating units and suitable reflectors, a current consumption of about 1 watt to each square foot of surface should yield an intensity of about 4 foot candles. Every effort should be made to prevent *glare*, which is present when some object in the field of vision is brighter than the object toward which the eye is directed. Glare makes seeing difficult and is injurious to the eyes. Walls should be finished with a yellow or light-green matte surface. Brown or deep green absorb light and make the room dark. White walls and polished surfaces cause glare. Welsbach lights and electric bulbs should be frosted or they should be provided with deep-bowl or cone reflectors extending below the light so that the eyes will be protected from the direct rays. Fish-tail gas burners and other open lights should be discarded on account of the flickering of the flame and the glare caused by the exposed light.

Ventilation.

Ventilation is the process by which air in inclosed spaces is frequently changed. By this means the bad effects of unfavorable air conditions are to a great extent overcome. These effects depend to a large extent upon the temperature and humidity of the air. The humidity is usually expressed as relative humidity, which is the ratio of the amount of moisture in the air at a given temperature compared with the amount it is possible for the air to contain at that temperature. It is determined by means of an instrument known as the Sling psychrometer (fig. 8), which consists of a pair of thermometers provided with a handle which permits them to be whirled rapidly. The bulb of the lower of the two thermometers is covered

with cloth, which is wet at the time the instrument is used. The thermometers are whirled for about a minute and the difference between the two noted. The relative humidity can then be easily calculated by means of a table furnished with the instrument.

At a temperature of 86° F. and a relative humidity of 80 per cent, a person begins to feel uncomfortable; there is a disinclination to work; the temperature of the body is raised, and the heart's action is accelerated. Under higher temperature there is frequently headache, nausea, vomiting, and considerable prostration. When the heat and relative humidity are excessive, the temperature of the body may rise to 104° F. or over, which, if not relieved, may be followed by unconsciousness and the symptoms of heat stroke. For a description of this condition see page 172. It is the combination of heat and moisture which makes the air intolerable. A man can stand without discomfort a much higher room temperature if the air is dry. The high temperature of the air diminishes direct loss of heat from the body, and the presence of moisture decreases evaporation of perspiration. Both reduce the elimination of body heat and cause a sensation of uneasiness and illness, especially when the air is stagnant. These symptoms are ameliorated by setting the air in motion, either by a fan or by opening the doors and windows and allowing a current of air to blow through the room. Cool air replaces the envelope of stagnant, hot, moist air that surrounds the body, the blood in the vessels of the surface of the body is cooled, the temperature of the body falls, and a feeling of well-being ensues.

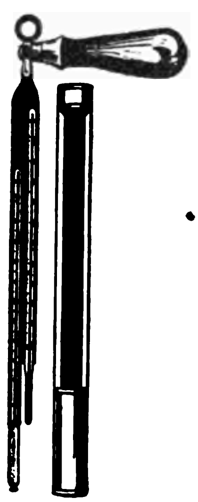


FIG. 8.—Sling psychrometer.

In winter the heated air of buildings is usually too dry; in fact, the relative humidity is often less than 20 per cent, which is drier than the air of a desert, the relative humidity of the driest climate of this continent being seldom less than 30 per cent. Harrington, in his book on Practical Hygiene, says:

When outdoor air is heated so as to maintain an even temperature of 70° F., but with no addition of watery vapor, its capacity for absorbing moisture is very much increased, and it will take it up from all moist objects with which it comes in contact. It will take it from the skin, from the mucous membranes of the mouth, nose, and respiratory tract; from furniture made from wood which, in the process of kiln drying, was never brought to such dryness; from the leather binding of books, causing them to crack and fall to pieces; and from plants, which, in consequence, wither and die. It thus causes more or less dryness of the skin, irritation of the throat, and cough. It causes also need of a higher temperature to give the same sensation of warmth and comfort than is the case with air containing a normal amount of moisture. Air

at 25° F. saturated with moisture and then heated to 70° F., would need more than 0.5 pint of water in every 1,000 cubic feet to give it a humidity of 65 per cent.

The relative humidity in buildings in wintertime should be at least 50 per cent. The nearer it is to the temperature of the room the more comfortable the room will be; but if the weather outside is very cold and the amount of moisture in the room is great, drops of water will collect on the windowpanes, making it difficult to see through the windows.

Moisture may be imparted to the air by means of humidifiers, one of which is shown in figure 9. This apparatus consists of a container, which holds about a gallon of water and which has a trough at its lower portion. The trough extends lengthwise between the coils of the radiator. In the trough is placed a large felt pad which extends up between the coils. Water absorbed by the pad and evaporated by the heat of the radiator is replaced by water in the trough, which is kept filled by means of a float valve. Where there is sufficient moisture in the air, an indoor temperature of 62° to 68° F. will be found to be comfortable.

Good effects of cold air are well known and many persons sleep out of doors on porches. Wherever possible, in any climate, one should sleep with the windows of his bedroom open. These should be wide open so as to have a good circulation of air. Persons suffering from pneumonia are now treated in a room without heat, the cold air entering through open windows being one of the best remedies that can be employed for this disease. In certain cases prolonged exposure to cold, damp, air may be injurious. Old people, children, and persons suffering from kidney diseases or rheumatism should not expose themselves to it. Healthy persons, however, if well covered, will not be injured by it.

Drafts are only dangerous to robust persons when they cause a chilling of the body. Children and old persons, owing to their feeble resistance to constant changes, should not expose themselves to drafts. A draft may do harm to a strong, well person if he exposes himself to it when his body is in an overheated condition. It may increase the tendency to catch cold or to have pneumonia. When the body is hot there is a large quantity of blood in the vessels of the surface of the body. Cold air suddenly thrown upon the skin causes these vessels to contract, by which means the blood is driven inward, producing a congestion of the internal organs. It is not positively known that this internal congestion causes a person to catch cold, but it is one of the explanations that has been made to account for this condition.

Persons who live in poorly ventilated houses for a long period of time become pale. They are inclined to be thin and usually look undernourished. Their resistance to disease is lowered and they are liable to contract colds, pneumonia, consumption, and other diseases.

Natural Ventilation.

Natural ventilation is that which takes place through openings, such as doors, windows, and cracks, in buildings. It also takes place, to some extent, through the materials of which the building is constructed. This form of ventilation depends upon changes in temperature. Cold air entering a room falls to the bottom. As it becomes warm it expands and either rises to the top of the room or goes out through the fireplace or stoves, where it assists in the combustion of fuel. A constant circulation of air is thus maintained. There are various ways of assisting this process. Air ducts may be placed in the inner wall, one at the top for an inlet and another at the bottom for an outlet. A window may be slightly raised for an inlet, a glass or wooden screen being used to deflect the air upward (fig. 10), and an outlet pipe may be placed over the fireplace, or a ventilator may surround the stovepipe. Figure 13 is a diagrammatic sketch of various provisions for ventilation. In large buildings in closely built-up cities, mines, big passenger vessels, and the like, some form of *mechanical ventilation* is necessary, as it would be impossible otherwise to remain in them. Ventilation is accomplished in these structures by three methods, one in which the air is forced into the room, another in which air is drawn out of the room, the third being a combination of the first two methods.

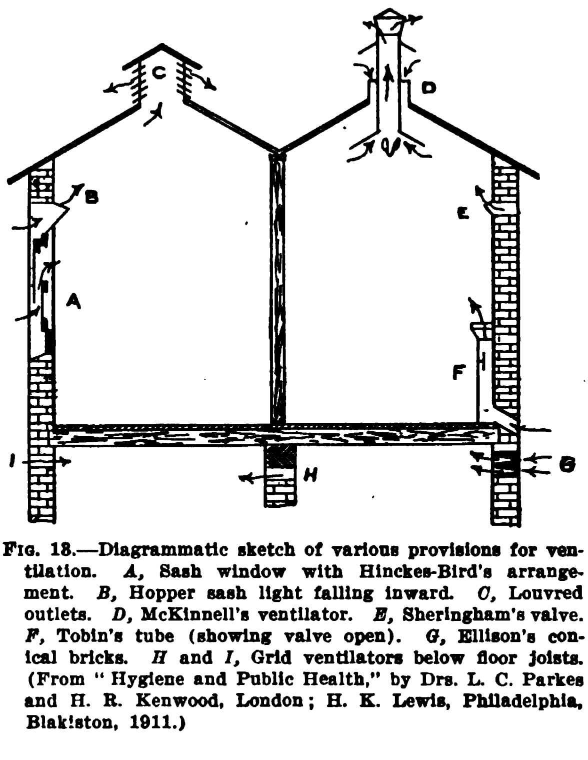


FIG. 13.—Diagrammatic sketch of various provisions for ventilation. *A*, Sash window with Hinckes-Bird's arrangement. *B*, Hopper sash light falling inward. *C*, Louvred outlets. *D*, McKinnell's ventilator. *E*, Sheringham's valve. *F*, Tobin's tube (showing valve open). *G*, Ellison's conical bricks. *H* and *I*, Grid ventilators below floor joists. (From "Hygiene and Public Health," by Drs. L. C. Parkes and H. R. Kenwood, London; H. K. Lewis, Philadelphia, Blakiston, 1911.)

The stream of air that is constantly passing through a well ventilated room not only reduces the temperature but sweeps away harmful gases resulting from the combustion of candles, coal oil, and illuminating gases. It also blows out dust, bacteria, and foul odors. There are sound reasons for the belief that diseases like consumption, pneumonia, and colds are transmitted by contact with persons suffering with or carrying the germs of the disease, which probably are not borne for any great distance through the air. The transmission may occur when the carrier of the germ coughs, sneezes, or otherwise sprays the secretion of mouth, nose, or throat over the faces of persons near him in street cars, theaters, or other places where persons collect in crowds.

Dust.

Dust is especially dangerous in certain occupations. It may be called "The greatest enemy of the workman." It may be of organic or inorganic origin. It is usually considered that dust of organic origin, such as cotton, wool, wood, coal, and the like is not so harmful as dust of inorganic origin, such as granite dust, which, owing to the hard sharp angles of its particles, is more irritating. In addition to these the air may contain metallic poisons and toxic gases, fumes, and vapors. Sommerfeld, in the table shown below, gives the death rate per thousand from consumption of persons engaged in various trades where dust is a prominent factor:

Occupation without dust production	2.39
With dust production	5.42
With porcelain dust	14
With iron dust	5.55
With lead dust	7.79
With stone dust	34.9
With stone workers	4.3
With wood and paper dust	5.96
With tobacco dust	8.47

Wool sorters' disease, or anthrax pneumonia, is an example of infection caused by the inhalation of animal dust. The germs of anthrax are breathed in with the dust from the wool and cause pneumonia. Dust containing sharp, gritty particles, such as are present during the cutting of hard rock, sets up a chronic irritation of the air passages, which then become favorable lodging places for the germs of consumption. The germs thrive in the weakened tissues and disease ultimately results. Soft-coal dust is less dangerous than hard-coal dust; miners working in bituminous-coal fields are not especially liable to tuberculosis. The bad effects of dusty working places may be obviated by the use of respirators. These are, however, rather uncomfortable to wear, so that the better way is to re-

move the dust at its source by mechanical devices or to prevent its accumulation in the air by the use of water.

Heating.

The proper heating of a building depends to a large extent upon ventilation. Most houses are imperfectly ventilated, with the result that as the air is abnormally dry, they are overheated, for dry air causes excessive evaporation and gives a sense of chilliness. Air at a temperature of 65° F. and a relative humidity of 70 per cent has a greater feeling of warmth and is more comfortable than air at a temperature of 73° F. with only 50 per cent moisture. As many heated rooms have a relative humidity of less than 50 per cent, the temperature of the air has to be maintained at a much higher degree than would be necessary if the proper amount of moisture were present. On account of this chilly feeling due to dry air, many persons wear too much clothing while indoors, with the result that a layer of moisture covers the skin, rendering the person susceptible to drafts and to the catching of cold. If the proper humidity is maintained indoors, a person therein need not wear warmer clothes in winter than in summer. When going outdoors the body may be protected from cold by heavy wraps.

Buildings are heated by fireplaces, stoves, hot-air furnaces, hot water, or steam, and to a small extent by electricity. An open fire is cheerful, and the hot chimney acts as a good ventilator for the room. It has been estimated that a coal fire burning briskly in a fireplace of the usual size will cause 18,000 cubic feet of air to pass up the chimney in an hour, but as seven-eighths of the heat of the fuel is carried up the chimney and lost, this method of heating is wasteful and inadequate for cold places, as many parts of the room in which the fireplace is located are insufficiently warmed, the heat reaching only those persons near the grate. It is similar in some respects to a fire outdoors, where the portion of the body turned toward the fire becomes too warm, while the opposite side is cold.

A stove is better than a fireplace in that it radiates heat in all directions if it is set out in a room. The air also coming in contact with the hot stove ascends and mixes with the rest of the air in the room, thereby giving a more even temperature. The hot fire and the stovepipe act as a ventilator, but as the amount of air passing through a stove is much smaller than that which ascends the chimney from an open fire, air conditions in a room heated by a stove are not as good as when a fireplace is used. An extremely poisonous gas, known as carbon monoxide (p. 22), may be produced in stoves in which combustion is incomplete and may pass out of cracks, if the dampers are closed, and there is not a free circulation of air to

carry the coal gases up the chimney. Cast-iron stoves, when red hot, may also allow, it is believed, this gas to pass into the room. A hot stove is also objectionable for the reason that small particles of organic matter in the air when falling on the stove become charred and yield unpleasant odors. These conditions may be avoided by not allowing stoves to become too hot, by seeing that there are no cracks in the fire box, and by not completely closing the dampers.

A gas stove or water heater should have a hood over it connected by a pipe with the chimney to carry off the products of combustion. With good ventilation, as by open windows, it may be possible to get along without this connection to the chimney, but care should be taken that no gas leaks from the feeding pipes, especially where rubber tubes are used, and that burners are free from soot, or otherwise the air of the room may be contaminated by carbon monoxide. This gas is less likely to be given off from oil stoves, as the perfect combustion of good oil does not produce this gas. An oil stove should not, however, be used in a tightly closed room.

Hot-air furnaces.—In this method of heating the air is drawn from the outside, through a pipe, over hot plates or tubes in the furnace, and conducted by ducts to different rooms of the building. Circulation of air in such a building is usually good, but the air is excessively dry from passing through the furnace, the water pans in these structures being entirely too small to supply the requisite amount of moisture. The futility of trying to supply the necessary moisture by contrivances of this kind is evident when the quantity of water that should be evaporated for this purpose is considered. For example, Surgeon Clark of the United States Public Health Service cites the following:

To supply a classroom of 35 pupils with 1,800 cubic feet of air each per hour at 70° F., with a relative humidity of 70 per cent for 7 hours, would require the evaporation of over 30 gallons of water, when outside air is taken at a temperature of 30° F., with a relative humidity of 70 per cent.

Hot-water and steam pipes.—The system of heating buildings by circulating steam or hot water through pipes is efficient so far as the warming of all parts of the building to which the pipes lead is concerned, but is open to the same objection as furnace heat, inasmuch as the air is rendered very dry by their use. In some cases the radiator is placed under a window and an air duct leads to the outside of the building. The cold air becomes heated in entering the room by passing through the hot radiator. This plan is fairly efficient in mild weather, but when the temperature is low the air is frequently insufficiently heated, and persons sitting in the room are apt to close the air duct. Another objection is that the air in cold weather is usually dry, the relative humidity being sometimes 50 per cent or less, and passing through the radiator renders it still drier. In other

cases hot water and steam pipes do not extend over the building, but the air is heated by passing over hot pipes in the basement. This method is little different from furnace heat and is no better than the latter unless moisture is added to the incoming air by means of steam jets or in some other way.

Electric heating.—This method of heating is very little used on account of the expense. It consists simply of resistance coils which heat the room by radiation and convection. Heating by this method has the same disadvantage as hot water and steam and requires special apparatus to provide moisture to the air.

Water Supply.

Good water is essential to life. It comprises about 70 per cent of the body weight and is necessary to provide elasticity and suppleness to the muscles, bones, cartilages, and tendons, to moisten various parts of the body so that they can perform their functions, and to act as a solvent for the food so that it may be absorbed. It also provides a fluid medium for the blood and lymph by which nutritive substances are taken to all parts of the body and waste products are removed. The quantity of water needed for each person for drinking and cooking is about 1 gallon per day; for washing and other purposes about 16 gallons per day. Many cities having large manufacturing plants supply a much greater quantity for each person; some as much as 250 gallons per day.

Great care should be taken to prevent water that is to be used by human beings from being contaminated with the germs of disease; typhoid fever, diarrhea, dysentery, cholera, tuberculosis, and probably other diseases may be acquired in this way. The eggs of intestinal worms are sometimes present in water, and if this water is swallowed full size worms may develop in the body. These germs and parasites get into water through the discharges of infected human beings or animals, and in order to prevent well persons from becoming ill it is necessary that water should be kept free from human and animal filth or that steps be taken to remove it before the water is used. Water may be of good color, have a pleasant taste and no odor, and still be unfit to drink. Its quality can not be determined until the place from which it has been obtained has been inspected and an examination made to determine what substances it contains and if any disease germs or animal parasites are present.

Water to supply cities is, for the most part, obtained from rivers and lakes, or from a reservoir made by throwing a dam across a small stream. If possible the drainage area from which the water is derived is in the hills or the mountains, where there are few, if any, habitations, for all surface water is contaminated by washings from the soil. Many privies are placed over streams or so near one

that their contents are carried into it whenever there is a heavy rain. Stables and pigpens on the sidehills drain into the streams in the valleys. It is never safe to drink water from a stream; in thinly settled sections the danger may be small, but it should be remembered that if the discharges from one person suffering from typhoid fever are emptied, without previous disinfection, into a stream, or such discharges are washed from a privy or otherwise gain access to the stream, whoever drinks the water may contract the disease. This is well illustrated by the epidemic which occurred in 1885 in the town of Plymouth, Pa., with a population of about 8,000, at which time 1 of every 8 inhabitants contracted the disease. Rosenau states:

Plymouth received its water from a mountain brook which drained an almost uninhabited watershed. The stream was damned at intervals, and the water was stored in a series of four small impounding reservoirs. The source of the infection was traced to a citizen who spent his Christmas holidays in Philadelphia and returned home in January. He contracted typhoid; the excreta were not disinfected, but were thrown either into the frozen creek or upon the banks within 25 or 30 feet of the edge of the stream. At this time the brook was frozen and remained so until spring. There came a thaw in March and the entire accumulation was washed into the brook and thence into the water main. Three weeks thereafter cases of typhoid by the score made their appearance throughout the town. On some days more than 100 new cases occurred. In all 1,004 cases were reported. Some estimates placed the number at 1,500—that is, 1 in every 5 of the inhabitants. There were 114 deaths. The epidemic was limited to the houses supplied with the town water or to persons who drank of the public water supply. The distinction was particularly emphasized on one street, where the houses on one side had one or more cases while the houses on the other side had none at all. The former were supplied by the town; the latter depended upon wells.

This epidemic will ever stand out in the literature as a clear-cut instance of water-borne typhoid caused by the quick transfer of virulent material from a single case. It proves further that freezing alone was not sufficient to destroy the typhoid infection, and on account of the coldness of the water it is exceedingly unlikely that any multiplication of the typhoid bacilli occurred. The infection, although greatly diluted, was nevertheless sufficiently virulent to induce the disease in most of those who drank the water. It further teaches the lesson how one person is sufficient to defile the "pure waters of a mountain brook draining an almost uninhabited territory." This epidemic was the first large outbreak in America where the cause was definitely traced to the water supply. It stands out sharply in the sanitary annals of our country on account of the lessons it taught and the good influence it had in stimulating other cities to safeguard and improve their water supplies.

Many cities obtain water from rivers which are foul with sewage. Such water has to be purified before it can be safely used. This is done by storing it in large settling basins, where much of the mud falls to the bottom, carrying with it many disease germs and other impurities; from these basins the water passes through sand filters, which are shallow reservoirs having at the bottom about 6 feet of

filtering material. The top layer of this material is composed of about 3 feet of fine sand, which rests upon a layer of fine gravel, under which is a layer of coarser gravel covering a layer of broken stone. (Fig. 14.) The water flows from the filter through pipes which are placed in the bottom layer. While in the filter it is kept at a depth of about 3 feet above the sand. These filters if properly operated will remove over 99 per cent of the germs present in the water. The standard adopted by the Treasury Department for drinking water supplied to the public by common carriers in interstate commerce, which should be the standard for all drinking water, requires that there be not more than 100 germs in 1 cubic centimeter (15 drops), nor more than 1 colon bacillus in 6 teaspoonfuls of water. The colon bacillus is a germ found in large numbers in the intestinal tract of warm-blooded animals, and its presence in water may be considered valid evidence that the water has been polluted

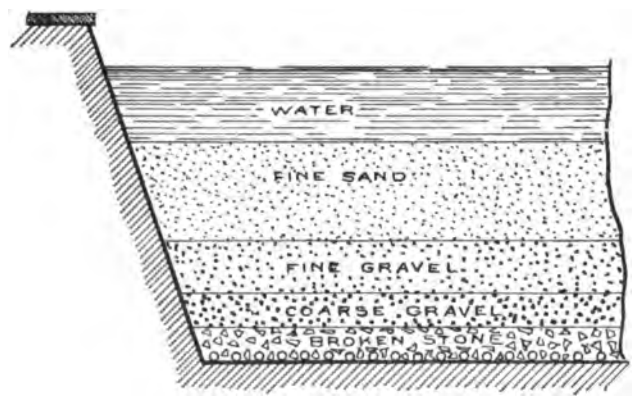


FIG. 14.—Section of a filter bed.

with intestinal discharges of man or some of the higher animals. From 1,000,000 to 5,000,000 gallons of water can be purified each day by the above-described filter if it is an acre in extent. Other filters, known as mechanical filters, if of the same size, can purify 100 times as much water in the time given. They consist of a tank containing a layer of sand through which the water passes after a small quantity (1 or 2 grains to the gallon) of alum or copperas has been added. These filters are useful where the water is very muddy, but they are more expensive to operate than the slow sand filters. Their action in removing germs is also not as uniformly high as the latter. Household filters are serviceable in rendering water free from mud, but no reliance should be placed upon them to remove germs.

Bleaching powder, which is also called "chloride of lime" and "chlorinated lime," is often employed to purify water. This action of bleaching powder depends upon the calcium hypochlorite which it

contains. This substance combines with the carbonic acid in the water to form carbonated lime. The chlorine which is set free unites with the hydrogen of the water, and the oxygen thus liberated kills the germs in the water. A good bleaching powder will average

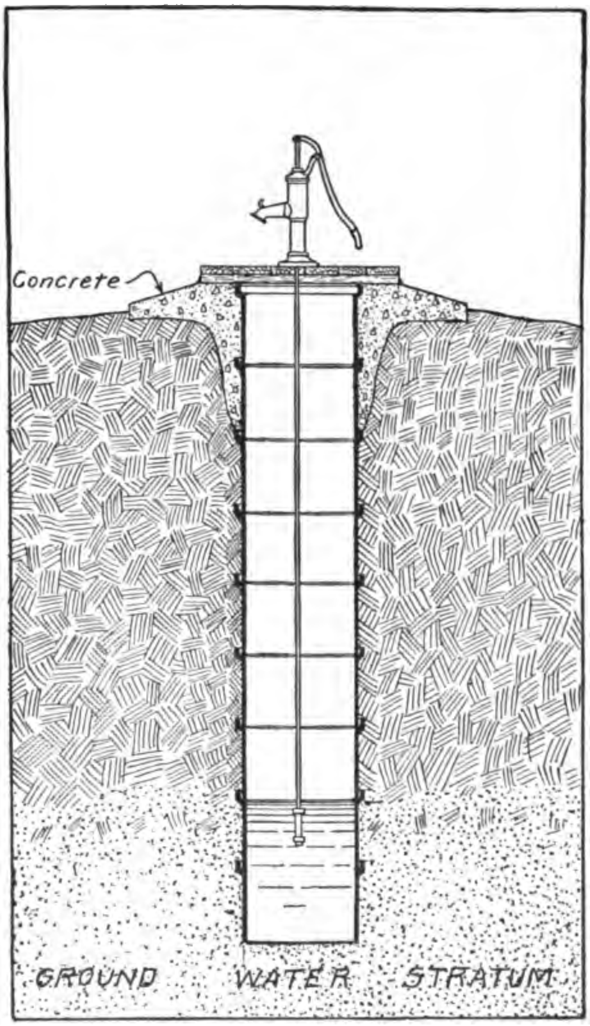


FIG. 15.—A model well, cased with terra-cotta pipe, curbed with concrete, and provided with a water-tight platform and a pump. The water from such a well is unmixed with surface water or filth. Properly located, such a well should furnish safe and healthful water. (Virginia Health Bulletin, vol. 3, No. 4, 1911.)

35 per cent of available chlorine. The quantity required to rid the water of germs varies from 1 to 3 parts of chlorine (3 to 9 parts of bleaching powder) to a million parts of water. This is a reliable, cheap, and efficient method of purifying water, except when it con-

tains a large amount of organic matter, when some preliminary treatment is necessary. Mud should be removed, as bleaching powder will not clarify water. When the bleaching powder is added in proper quantities, no unpleasant taste is perceptible in the water nor is any undesirable chemical compound formed in it. Large cities should place their main dependence upon sand filters, but the hypochlorite method may be resorted to as a temporary measure in case a supply pipe breaks or if for any other reason the filtering plant is put out of action. A few years ago, at Germantown, Pa., one of the main supply pipes leading from the filter broke, and it was necessary to furnish part of the town with raw water from the Schuykill River for a few days. Over 300 cases of typhoid fever occurred within a short time in the part of the city using this water. A year or so later a similar accident occurred and it again became necessary to furnish a portion of the city with raw water, but on this occasion the water was treated with bleaching powder, with the result that there was no increase in the number of typhoid fever cases over the number normally present.

Where it is necessary to purify only a small quantity of water the solution is prepared by dissolving 1 teaspoonful of fresh bleaching powder in 1 quart of water. This should be placed in a tightly stoppered bottle and kept away from light. To disinfect water add 1 teaspoonful of the disinfectant solution so prepared to each 2 gallons of water, stir the water thoroughly, and allow it to stand for 15 minutes, when it will be ready for use.

Persons living in the country and in small villages have to depend as a rule upon wells, springs, and cisterns for their water supply. Great care should be taken to prevent their pollution.

The shallow well.—The well should be at least 200 yards away from a stable, privy, or hogpen. If these structures are on a slope, the well should be above them, never down hill from them, as the soil becomes polluted with filth, which may seep through the ground into it. The trough for watering stock, if one is required, should be 40 feet away from the pump and an iron pipe should be used to convey the water to it. The well platform should be higher in the center than at the sides so that water falling on its surface will drain off. This platform should be water-tight and have a raised rim and form a tight joint at the foot of the pump. The curb should be made of concrete, brick, or masonry laid in cement mortar. It should rise 1 foot above the surface and extend 2 feet into the ground. It is important to have the casing water-tight so that no water can enter the well except that which comes through the bottom. Terra-cotta sewer pipe is the best material to use for this purpose. The joints should be held together with cement. The earth should be packed tightly around the casing. Sand should be used for this purpose, if it is available, as it is a good filter.

The old-fashioned well bucket should not be used, as it may act as a vehicle to carry dirt into the well. This bucket is frequently set on the well platform, where it may be soiled by filth brought to the platform on the feet of a chicken or the sole of a shoe. The water becomes polluted with this material when the bucket is dropped back into the well. The bucket chain or rope may also be soiled by unclean hands when the water is being drawn up or the bucket is being emptied.

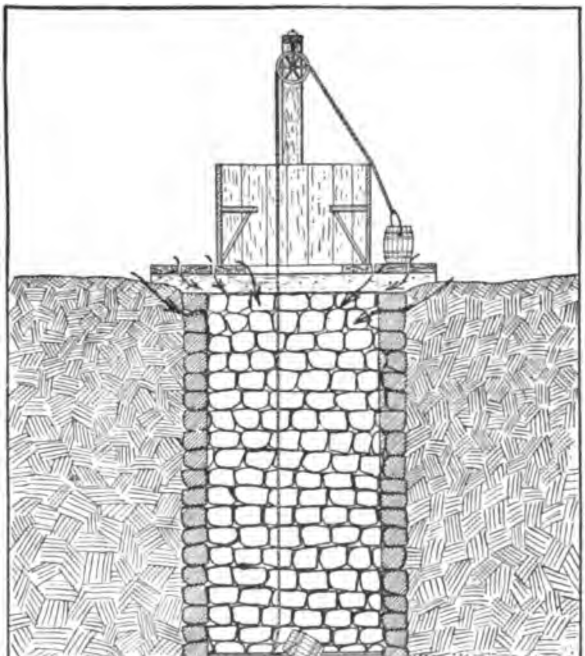


FIG. 16.—A typical insanitary shallow well. Filth enters such a well through cracks in the platform, is washed into it by surface water through holes under the platform, seeps into it through the loose casing, and is carried in by the bucket or the rope soiled by filthy hands. (Virginia Health Bulletin, vol. 3, No. 6, 1911.)

Deep or artesian wells.—These wells are less liable to pollution, as the water is not drawn from the soil immediately adjacent to the well. The hardpan or rock through which the bore of the well passes prevents the deep water from becoming polluted by the surface water near the well. The places where this deep water falls upon the ground as rain may be a long way from the well and the

ground through which it travels purifies it. This is the case in all instances except where the water has come through crevices in lime-

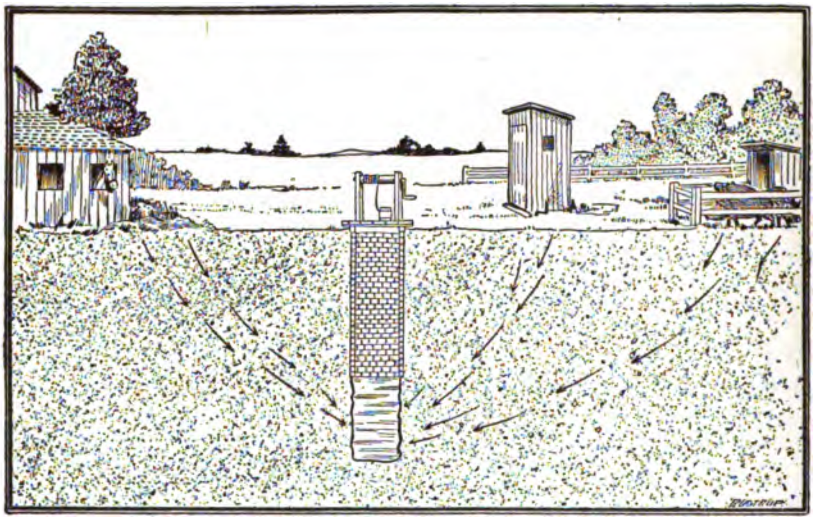


FIG. 16a.—Heavy pollutions of the soil about the well from the privy, stable, and hogpen will in time overcome the natural purifying agencies of the soil and will seep through the ground into the well. (Virginia Health Bulletin, vol. 3, No. 6, 1911.)

stone rocks, as water may travel for miles through such spaces without being purified.

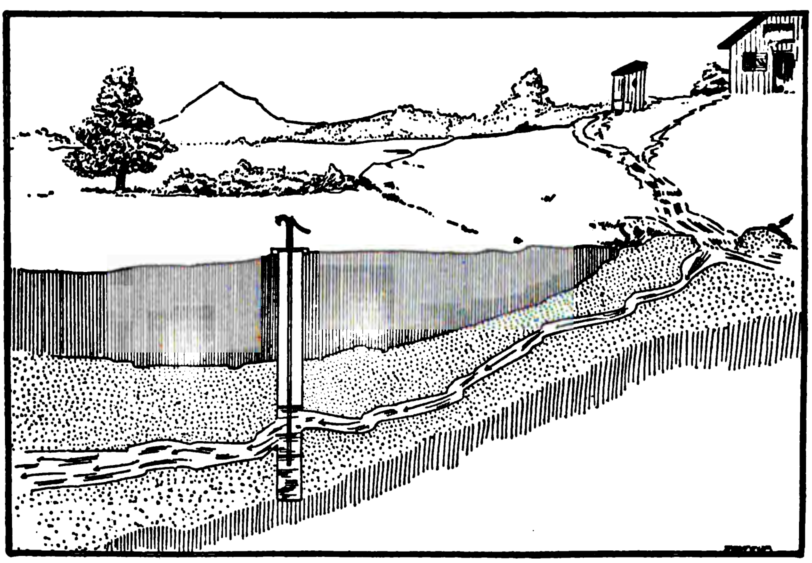
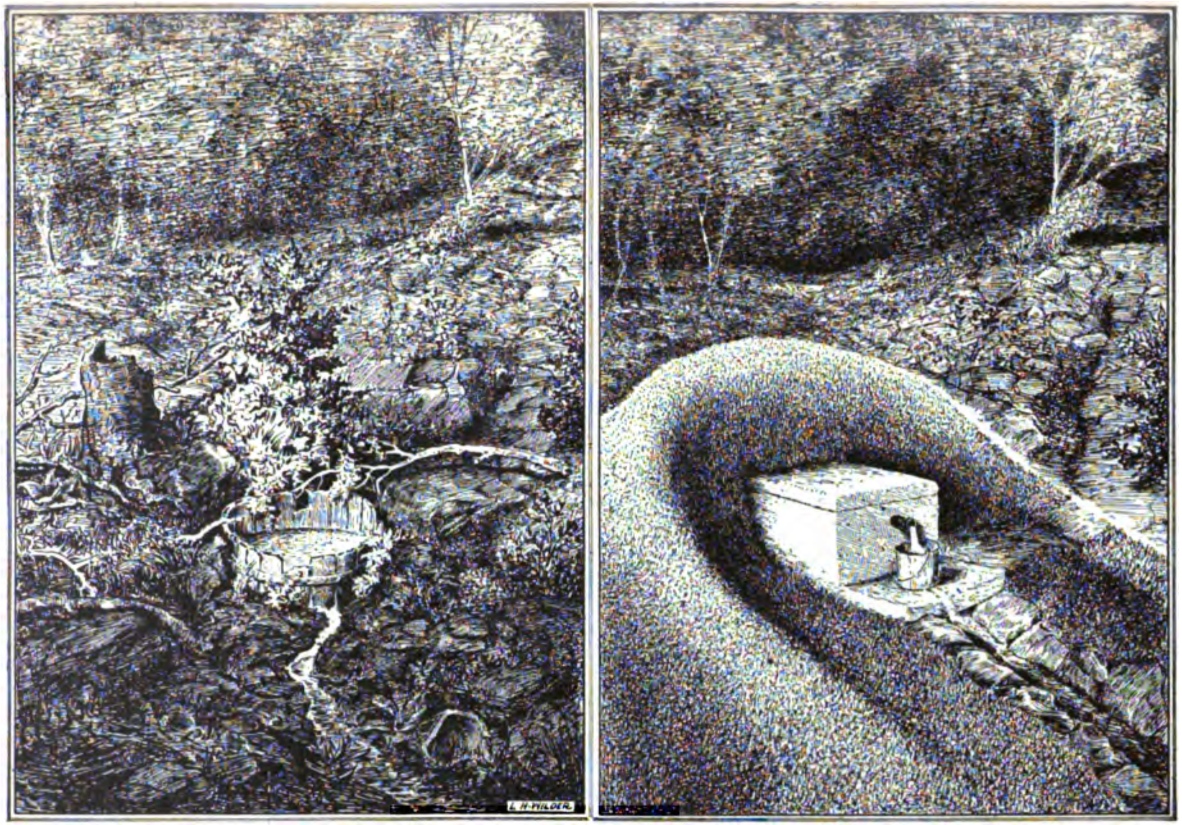


FIG. 17.—Diagram showing pollution of wells in limestone soils. Surface water, heavily polluted, frequently disappears in a crevice in the limestone and may carry filth to wells and springs near at hand or long distances away. (Virginia Health Bulletin, vol. 1, No. 14, 1909.)

A deep well may become polluted from the surface if the casing is defective or if it does not extend down to the hardpan or if the pipe



U.S. PUBLIC HEALTH SERVICE

FIG. 18.—Pollution and protection of a spring. The spring on the left receives pollution by washings into it from the slope above and from the soil immediately around it. It may also be polluted by dirty vessels dipped into it. The spring on the right is protected against surface washings by the ditch and by the concrete spring box. It is inclosed and provided with a discharge pipe so that vessels need not be dipped into it. It furnishes water as pure as when it comes from the ground, unmixed with surface water or filth. It should furnish pure water.

is not properly braced. If the pipe moves or rocks, surface water may flow down a channel along its sides and thus mix with the water at the bottom.

Driven wells are good in sandy regions. Care should be taken to see that they are placed at a safe distance, fully 200 yards from the privy or barnyard. The well should be provided with a tight platform and the earth should be banked up around it. Dirty water should not be employed for priming the well, but only water that has been kept in a clean, covered bucket.

FIG 19.—An insanitary privy of primitive type permitting extensive soil pollution. Reproduced from a photograph. (Original.)

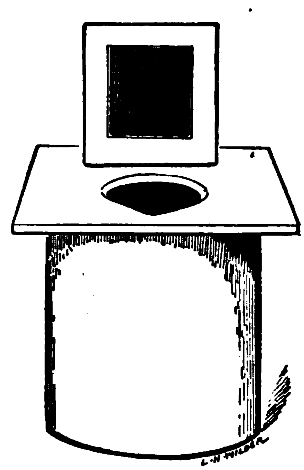


FIG. 20.—Covered can. The simplest type of sanitary receptacle privy. Used with a suitable drying powder, or disinfectant solution, it may be kept sanitary and practically odorless. The seat should be provided with cleats on the under surface to hold it in place on the can. (Original.)

Springs should be inclosed in a brick or cement box with an outlet pipe so arranged that the water may run into a bucket placed beneath it. This arrangement prevents contamination of the spring by dipping the bucket or cup into it. The spring should have a ditch running around it on the upper side to carry off the surface water, as this water, if allowed to flow into the spring, may carry filth and dirt with it. No water from a spring should, of course, be used if the spring is situated on a slope below a stable, insanitary privy, or pigpen, as the water may be polluted by filth which seeps through the ground from such places.

Cisterns should be water-tight, as cracks may admit polluted water from the ground. They should have water-tight covers to keep out dirt and also to prevent mosquitoes from breeding in them. After a dry spell the first washing from the roof should not be allowed to run into the cistern, as it contains dust and dirt which has accumulated on the roof since the last rain.

Sewage Disposal.

It is important that the discharges from the human body should be removed from the premises as speedily as possible. A water-

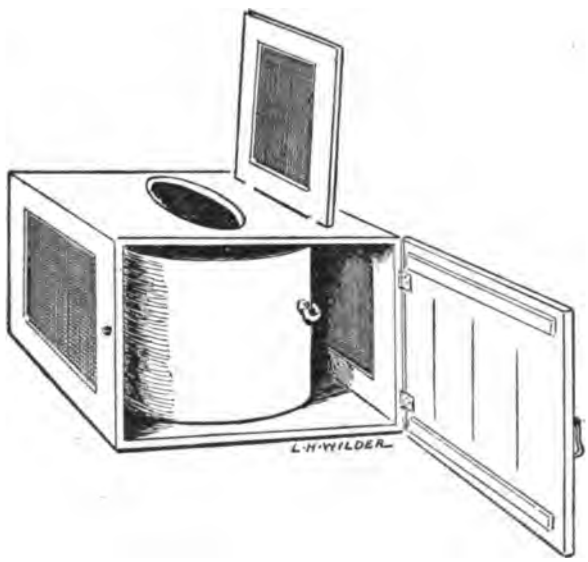


FIG. 21.—The boxed receptacle. Flies are excluded by the fly-tight box. Ventilation is provided by screened openings in the sides of the box and in the lid. The hinged front permits ready removal of the can for cleaning. Such a device is safe, sanitary, and convenient, and may be placed in an existing privy house or in any suitable outbuilding. (Original.)

closet connected with a sewer affords a means of disposing of human waste which has many advantages over the privy or cesspool. As the former is usually placed in a heated room a person using it does not become chilled, as is frequently the case when he has to go outside to a privy. The sewer removes the material to a distance and prevents contamination of the soil and its conveyance by flies to food. It is advisable that all buildings be provided with a water-carriage system, but it is especially important that this be the case in towns having a population of over 3,000.

In thickly settled sections of the country the sewage should be given some preliminary treatment to render it less dangerous before

it is emptied into a river or lake. There are a number of ways of doing this, among which may be mentioned the spreading of the sewage over the surface of the ground at a location which will not render it objectionable to the inhabitants of the city; it may also be treated by means of a sand filter in the same manner as water; or if the ground is of sandy formation it can be spread upon the ground and allowed to soak into the soil; trickling filters may be used by which means the liquid sewage is sprayed over rocks and thoroughly exposed to the air, the purified sewage running off through drains at the bottom of the pile of rock. When there is a large quantity of trade waste in the sewage, sedimentation may often have to be used, lime, copperas, or alum being employed to hasten the precipitation. Large settling tanks may be employed in which the sewage is allowed to remain from 8 to 24 hours, during which time some of the solid substances undergo liquefaction. From this tank the liquid sewage flows over rock, laths, or other rough surfaces whereby it comes in contact with the air. Sewage may also be disinfected, after it has been subjected to the action of the air, by the addition of bleaching powder, but this is not often necessary, as it is not intended to free it entirely of bacteria but only of a large percentage.

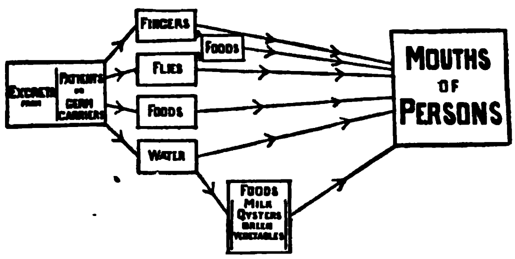


FIG. 22.—Modes of spread of typhoid fever, dysentery, and Asiatic cholera from person to person.

The efficiency of the various methods described above is given by Whipple as follows:

Method:	Percentage removal of bacteria.
Septic sedimentation	25–75
Chemical precipitation	40–80
Trickling filters	90–95
Sand filters	95–98
Spreading on sandy soil	97–99

Plumbing.

Sewer air is objectionable in the same manner as any impure air would be, but the old idea that many diseases are contracted through sewer air is no longer considered tenable as the danger of contracting these diseases by breathing this air is extremely small. Sewer pipes leading into a house should have a trap at the connection of the house drain with the street, and in such cases it is questionable whether it is necessary to have other traps in the building. The

system of traps and vents now in use is unnecessary, and the plumbing of the future should be developed along simpler lines, thereby saving expense to the builder without loss in efficiency.

Privies.

In rural districts and in small towns which have no water-carriage system, privies should be used to dispose of the discharges from the human body. If a privy is properly constructed, intelligently used by all members of the family, kept in repair, and the contents removed at regular intervals and deposited in a safe place, the water supply will not be contaminated and flies and other insects will not carry disease to persons living in the home or in the neighborhood. The privy should be screened, should be provided with an automatically closing lid over the opening in the seat and should have a watertight receptacle to receive the discharges, arranged so as to be easily removed or cleaned.

The following types of privies described in the publications of the Public Health Service conform to the principles of sanitation and have proved in actual use to be practical.

Covered can.—This is simply a can with a closely fitted wooden top, having a suitable hole covered by a hinged screened lid.

Boxed can.—In this type the receptable is inclosed in a box with a suitable hole in the top, covered by a lid. The top or side should be hinged to permit the taking out of the receptacle for emptying. The box should be somewhat larger than the receptacle in order that its removal may be easily effected. The receptacle may be placed in the back of a privy, if it is so desired, and the space around it boxed up with a screen door at the back. Such an arrangement keeps the discharges off the ground and prevents flies from breeding in or feeding on them. The box should be well ventilated either by screened openings or by a ventilating flue to remove objectionable odors. Lime, dry earth, and ashes may also be mixed with the feces for this purpose, a cupful being placed on each stool immediately after it is deposited.

The L. R. S. privy.[1]—If human excreta are permitted to undergo natural fermentation, the solid matter becomes liquefied and a considerable proportion of the excrement and urine is carried away by evaporation and gas formation. Thus the labor and cost of disposing of the matter may be lessened. These principles are applied in the L. R. S. privy. (Figs. 26 and 28.)

[1] Lumsden, Roberts, and Stiles: "Preliminary note on a simple and inexpensive apparatus for use in the safe disposal of night soil." Public Health Reports 1910, Nov. 11, v. 25 (45), pp. 1623–1629. Stiles and Lumsden: The Sanitary Privy. Farmers' Bulletin 463 (U. S. Department of Agriculture), pp. 17–21. Lumsden: Public Health Bulletin No. 51, pp. 46–49.

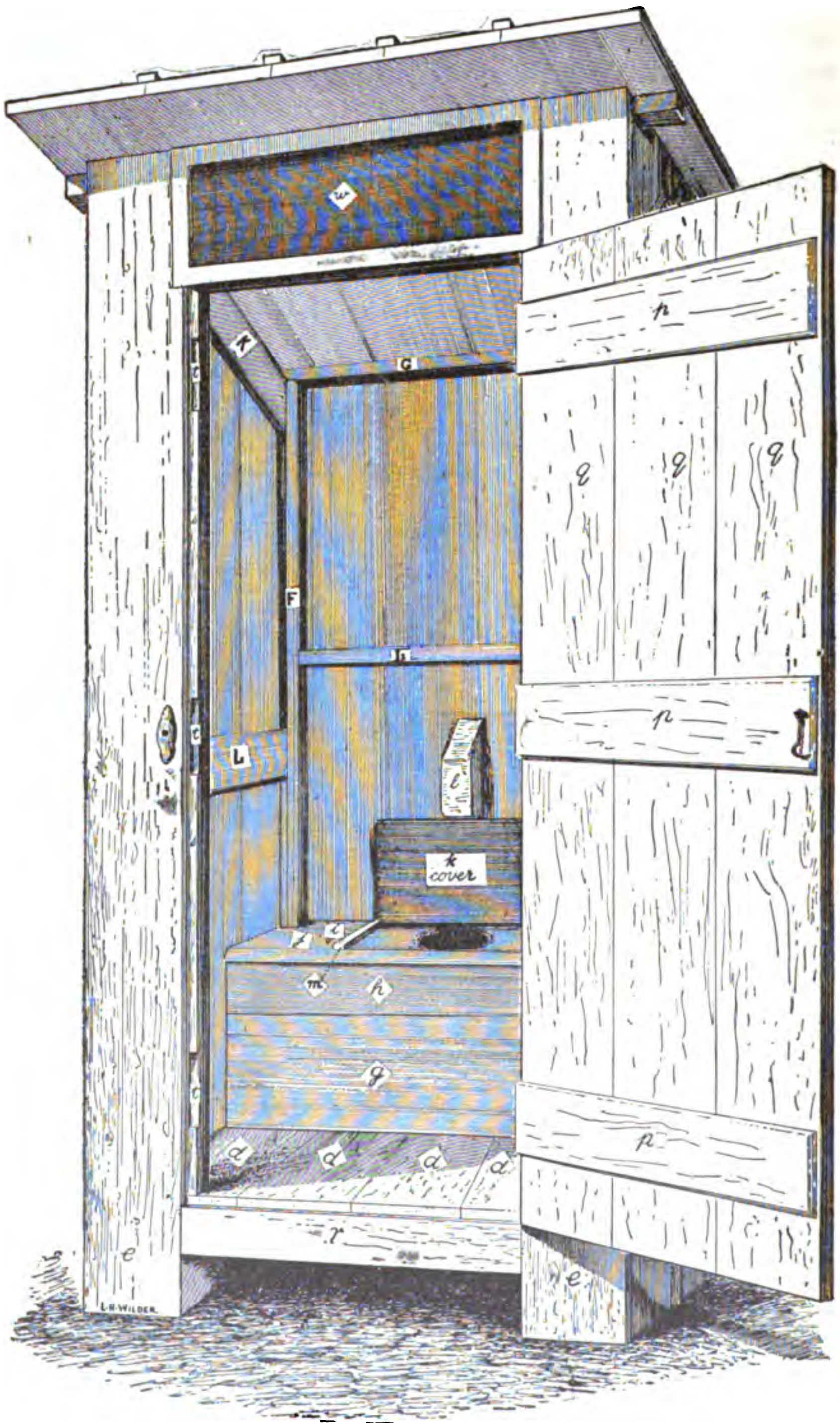


FIG. 23.—Front view or removable-receptable privy. (Stiles, 1910.)

This apparatus consists of the following parts:

(1) A water-tight tank, barrel, or other container, to receive and liquefy the excreta.

(2) A covered water-tight can, pot, barrel, or other vessel, to receive the effluent or outflow.

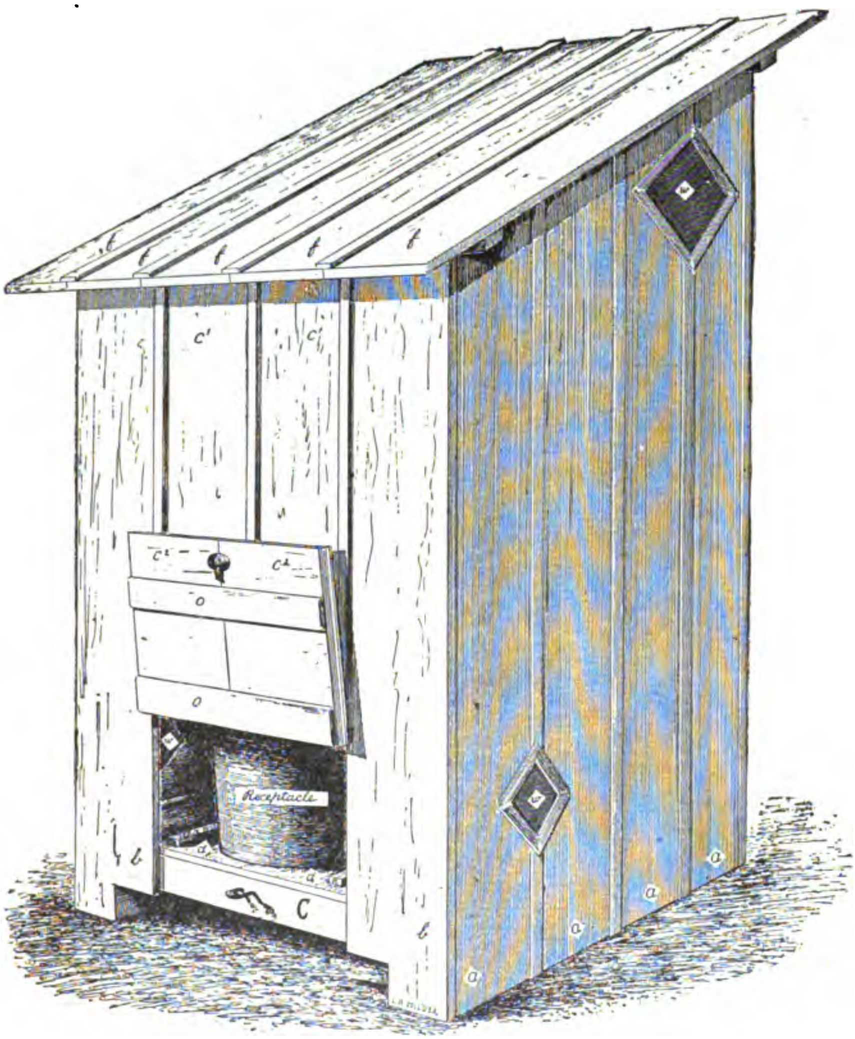


FIG. 24.—Rear and side view of a removable-receptacle sanitary privy. (Stiles, 1910.)

(3) A connecting pipe about 2½ inches in diameter, about 12 inches long, and provided with an open **T** at one end, both openings of the **T** being covered with wire screens.

(4) A tight box, preferably zinc lined, which fits tightly on the top of the liquefying barrel. It is provided with an opening on top for the seat which has an automatically closing lid.

(5) An antisplashing device, consisting of a small board placed horizontally under the seat about an inch below the level of the transverse connecting pipe. It is held in place by a rod, which passes

FIG. 25.—A sanitary removable-receptacle privy made by building a fly-tight box under the seat of an open-in-back insanitary privy and by placing a water-tight receptacle in the box. (Original.)

through a hole in the side of the seat and by which the board is raised and lowered. A layer of chips floated in the tank may be used instead of this antisplashing device.

(6) A ventilating pipe, such as a stovepipe or wooden flue, connecting the space under the seat with the open air.

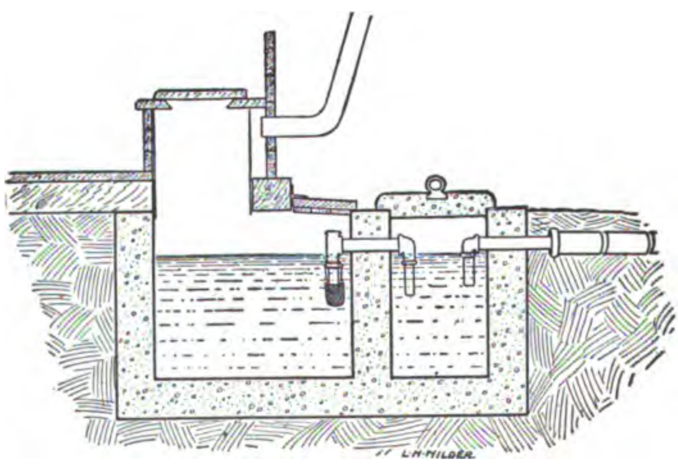


FIG. 26.—An L. R. S. privy with tanks made of concrete and with direct distribution of effluent into top soil. (Original.)

The liquefying tank is filled with water up to the point where it begins to trickle into the effluent tank. A pound or two of old manure should be added to the water to start fermentation. As an insect repellent a film of some form of petroleum may be poured on the surface of the liquid in each container.

When the privy is to be used the rod is pulled up so that the antisplashing board rises to within about 1 inch of the surface of the water. The fecal material falls into the water, but this board prevents splashing. Before leaving the privy the person should sink the antisplashing board by pushing down the rod so that the fecal matter and the toilet paper will float free into the water.

Although some of the fecal matter floats, it is protected both from fly breeding and fly feeding in the following ways: First, by the automatically closing lid; second, by the water; third, by the film of oil; and fourth, by having the apparatus located in a screened place, which should be done for additional safety. The film of oil prevents the breeding of mosquitoes in the tank.

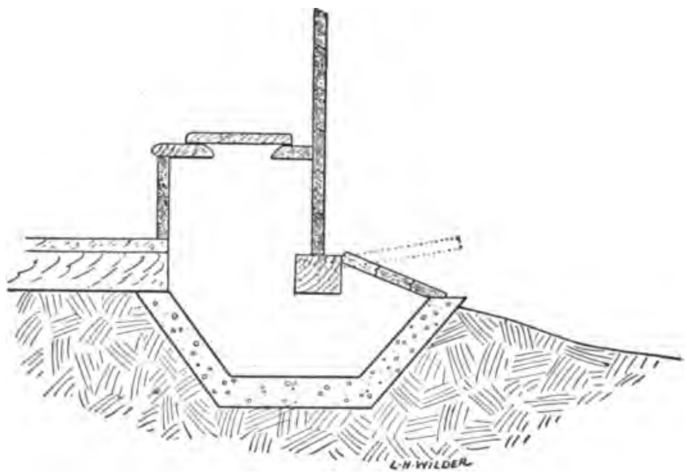


FIG. 27.—A stationary-receptacle sanitary privy with a cement vault arranged for convenient cleaning. (Original.)

The fecal material ferments in the water and gradually liquefies. Disinfectants must not be used in the liquefying tank because they stop the fermentation. When the level of the liquid is raised the excess flows into the effluent tank, where it is protected from insects by the cover and a film of oil. The effluent may be allowed to collect in this tank until it reaches the level of the connecting pipe, when it may safely be disposed of in any one of the following ways:

Burning.—In cities, towns, and villages privy contents may be disposed of most conveniently, most safely, and most economically by burning with other refuse in an incinerator. At country homes also disposal by burning is the safest method; but because of lack of facilities at such homes it is usually not feasible.

Discharge into a sewer.—If a sewer is available, privy contents may be dumped through a manhole directly into it and the sewer flushed with water from a fire hose. In doing this precautions (grit cham-

bers or gratings) should be used to prevent choking of the sewer with coarse insoluble matter. From a sanitary standpoint, the diluted privy contents are as safe for discharge through the sewer as is the sewage of the community.

Burial.—In small villages and country communities the disposal of privy contents by burial is usually the most available method that is practicable. The place selected for burial should be at least 100 yards away from any water supply and should not drain toward it.

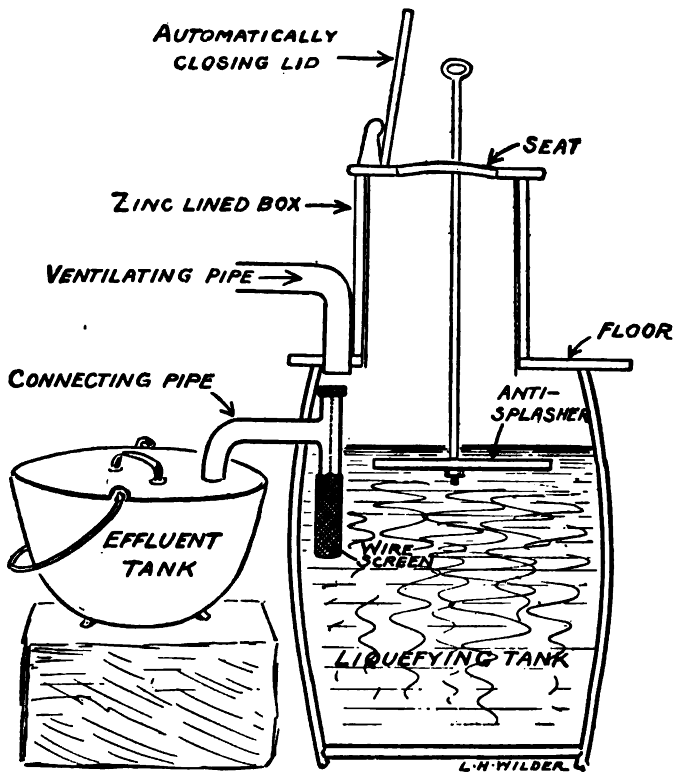


FIG. 28.—An L. R. S. privy with an ordinary vinegar barrel used as a liquefying tank and an iron pot for effluent tank. (Original.)

To take advantage of the natural agencies of purification in the soil and to protect underground sources of water supply as much as possible, the burial should be in the upper 2 feet of the soil. Furrows (such as are made by an ordinary plow) or narrow trenches should be used rather than large pits, so that the purifying agents of the soil will not be overworked. As an additional safeguard, disinfection of the excreta by heat or chemicals may be employed before such burial.

The effluent from the L. R. S. privy is particularly adapted to disinfection. If human excreta are disinfected by boiling, the matter is safe for use as a fertilizer, even near the dwelling.

The field used for the burial of untreated excreta should be one which is not to be cultivated for at least 6 months; and in sections where hookworm disease prevails a minimum of 12 months should be allowed. In cold climates trenches should be dug before the ground freezes. They should be ample to take care of privy contents during the winter and should be marked with stakes, so that they may be found even when covered with snow. The matter put into these trenches should be covered as soon as the ground thaws. Trenches for winter use should be about 2 feet deep. In open weather, the matter should always be covered immediately; the furrows should be from 6 to 12 inches deep; and the excreta scattered along the furrow, in a layer not more than 2 inches in thickness, and covered with 6 to 12 inches of earth.

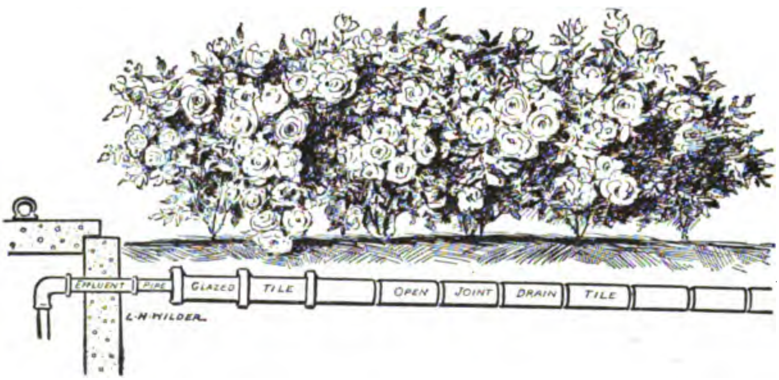


FIG. 29.—Distribution of effluent from an L. R. S. privy into top soil. The effluent pipe is cemented into a glazed (water-tight) terra cotta pipe which extends to the disposal ground. The effluent is distributed into the soil by means of open-joint drain tile. (Original.)

The use of a field for the burial of human excreta in this manner increases the fertility of the soil. This is particularly the case if the matter is given as much as 12 months to undergo thorough rotting.

The effluent from an L. R. S. privy is more readily purified by the natural agents of the soil than are crude excreta. It is liquid, and its volume is relatively small. It is therefore well adapted for direct disposal into the active subsurface soil. (Fig. 26.) The place selected for such disposal should be well away from (at least 50 yards) and not draining toward any water supply. The effluent may be conveyed under ground through a water-tight pipe for the necessary distance and then distributed into the soil by means of drain tile. The tile should be laid about 12 inches below the surface of the ground. If the soil is not porous, the distributing pipe may be laid in a trench filled with sand or gravel. The increased fertility of the soil along the track of the distributing pipe may be used advantageously to cultivate an attractive hedge of rose bushes (fig.

29) or other shrubs or to cultivate a row of corn or other plants, the edible parts of which are produced well above the surface of the ground.

Disposal of Refuse.

There are two methods of disposing of refuse generally in use in cities—the mixed system and the separate system. In the "mixed" system ashes, waste paper, garbage, and all sorts of rubbish are placed together in one can and removed several times a week to an incinerating plant where it is burned. The combustible matter in the refuse is usually sufficient to evaporate the water in the garbage, so that the material is self-consuming and requires but very little additional fuel. Steam generated by the heat may be employed to heat buildings or to run power plants for the use of the city. As the garbage is mixed in with ashes and other waste materials in this method there is less odor and it is not liable to attract flies and mosquitoes.

When the "separate" system is used the ashes and other rubbish are kept in separate cans from the garbage. There should always be two cans for the latter, one to be washed and allowed to dry while the other is being used. Special care should be taken to see that the cans have tight-fitting covers, so that the garbage may not be a source of food for rats or a breeding place for flies and mosquitoes. In large cities this garbage, after being collected, is often taken to a reduction plant, where the grease is saved for the extraction of the glycerine and for making soap, while the solid material, known as tankage, is utilized as a filler for fertilizers.

Cleaning.

Buildings which are inhabited by human beings should be kept scrupulously clean, and in cleaning great care should be exercised to avoid the stirring up of dust, the bad effects of which have already been pointed out in connection with the ventilation of buildings. (See p. 19) Wooden floors of living rooms should be varnished or waxed and polished so as to present a hard glistening surface. Only the best quality of varnish should be used, as the cheaper grades are sticky and gather dust. The cracks of old floors should be filled, after which the floors should be planed or sandpapered and then varnished or waxed. Carpets give a homelike appearance to rooms, afford some protection from cold, deaden the sound, and, on account of their elasticity, are comfortable to the feet, but they are great collectors of dust and dirt and are therefore insanitary. They are also difficult to keep clean and favor the development of vermin. On account of these disadvantages many persons have given up the use of carpets.

Rugs are less objectionable, as they can be easly removed and cleaned on the outside of the building. Matting that is tacked down should never be employed, as large quantities of dust will collect beneath it, which is diffused in the air by persons walking across the floor. Kitchen and bathroom floors, and halls where marble is used, should be frequently scrubbed, using plenty of soap and water. Cement floors should be kept painted, as otherwise they give off a fine dust. Linoleum is very useful in kitchens and the halls of large buildings. It should be carefully laid, the floor first being thoroughly cleaned, a cement paste put on the floor, and the linoleum then carefully fitted in place. Heavy weights should be placed along the seams. If the linoleum is put down in this way no water will get beneath its surface, and it makes a very satisfactory covering for the floor, as it can be easily cleaned with a little soap and water. Calcimining should not be employed except in cellars and for outbuildings, as walls thus treated can not be cleaned without streaking the dust over the surface. Painting is the best treatment for walls; wall paper is objectionable because it is difficult to clean.

Great care should be exercised in cleaning a house to prevent the dissemination of dust. It is of no value to stir up the dust in a room, simply brushing it off of one place and letting it settle in another. For this reason dry sweeping and dusting should not be employed. Carpets should be cleaned with carpet sweepers or vacuum cleaners, and if necessary to use a broom the carpet should be taken out of the building, or, if this is impracticable, the windows of the room should be thrown wide open so that there will be a circulation of air to blow the dust out. A person using a broom in this way should have a piece of cheesecloth tied over the face to prevent, as far as possible, the inhalation of dust. Polished floors should be cleaned with woolen floor dusters. (See fig. 30.) The dust sticks to these woolen brooms and is not scattered about the room as when a corn or hair broom is employed. The wool can be cleaned by washing it in hot soapsuds; after drying, it should be dipped in kerosene oil and permitted to dry again without wringing. Another method of treating these brooms is to place them in gasoline, to which an ounce of floor oil has been added to each quart. These brooms can now be purchased on the market prepared for use. If the floor is very dirty a hair broom should first be used with a sweeping compound, the latter usually consisting of sawdust or paper moistened with a little water or oil. The dust sticks to the sawdust and is thus prevented from being blown about the room. Walls should be cleaned with soap and water and frequently dusted with one of the wool dusters described above. Feather dusters and dry cloths should never be used for removing dust from furniture as

these articles scatter the dust as badly as corn brooms when sweeping the floor. Wool dusters with short handles (fig. 31) or cloths treated with kerosene or gasoline in the same manner as the wool floor dusters are prepared are the best for this purpose.

TRANSMISSION OF DISEASE BY INSECTS.

Flies.

There are many kinds of flies, the most important in this country being the house fly. Among others may be mentioned the blue-bottle fly, the green-bottle fly, the stable fly (which is a biting or blood-sucking fly), the cheese fly, the lesser or small house fly, the fruit fly, the sand fly, and the tse tse fly (also a biting fly, a native of South Africa, which causes the disease known as sleeping sickness).

The house fly is found in nearly all parts of the world, but seldom in places where there are no human habitations. It consists of a head, thorax, and abdomen. In the head are several thousand eyes. It is believed, however, that it depends more on its sense of smell than its vision in finding its food. It sucks its food up through a tube, called a proboscis, attached to the under portion of the head. The wings are fastened to the thorax. There are three pairs of legs covered rather thickly with coarse hair. The breeding season in the North is from May to October, while in the South it begins as early as March. The eggs are deposited in batches in fresh horse manure, kitchen refuse, decayed vegetables, human excreta, putrifying animal matter, or any other kind of organic filth. In such substances the proper temperature, moisture, and food for fly propagation is found. Their number increases very rapidly, as a fly is fully developed in 8 or 10 days after birth, and each female is capable of laying 100 or more eggs. The eggs are smooth, white, glistening bodies. Under favorable circumstances they are transformed into larvæ or maggots within 12 hours. These reach maturity in from three to six days and leave the substance in which they are hatched and burrow into the ground or travel several feet along its surface. A contraction of the maggot now occurs; it changes to a dark color, and is known as a pupa. In this stage the

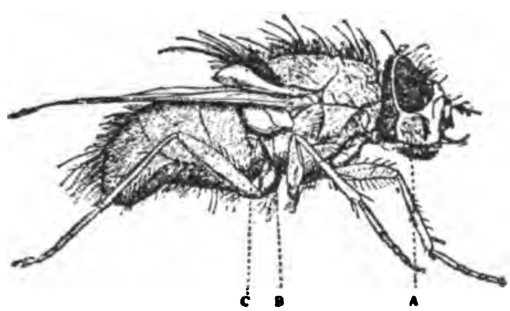


FIG. 33.—Side view of blow-fly (*Calliphora erythrocephala*) (× 5). *A*, Cheek (jowl); *B*, squama; *C*, halter.

wings and other structures of the full grown insect attain their full development, and in about three days the adult fly breaks through the sack and escapes.

Substances intended for human consumption should be protected from house flies, as these insects may carry the parasites or microorganisms of disease on their bodies, especially on their wings and hairy legs, from privies and other places where such agents abound. Solid food is contaminated by their crawling over it, and liquids by their drinking it or falling into it. Flies also have a habit of regurgitating their food after it is swallowed and smearing it on articles over which they crawl. (Fig. 35.) As this material may have come from privies, cuspidors, or other places where disease germs may be present, it is evident that these germs may be left on food or in drink with which the fly comes in contact and cause disease in the person swallowing it. The same germs may also pass through the fly's body and be deposited as part of its excreta on food, and thus gain an entrance into the human body.

Among the diseases which may be transmitted by the house fly are typhoid fever, diarrhea, dysentery, cholera, and probably tuberculosis, diphtheria, and scarlet fever. It is also believed that the eggs of intestinal worms, such as tape worms, hook worms, and round worms, may be carried to human beings by flies.

Eradicative measures.—Lizards, toads, spiders, and wasps are the natural enemies of the fly. Beetles, ants, and birds feed on both larvæ and pupæ. These animals, however, make but slight inroad upon the fly population. There is a disease which attacks and kills great numbers of flies late in summer; it is caused by a fungus which invades the body and destroys the vital organs. It is more prevalent from August to October, and accounts to some extent for the decrease in the number of flies at this time of year.

In order to eradicate the fly it is necessary to do away with its breeding places. Privies must be screened so that flies can not get into them. Garbage must be kept in covered containers until it can be burned or buried, and fresh horse manure must be removed from the premises at least every four days, as but four days are required from the time the eggs are deposited until the maggots begin to migrate from the manure heap into the ground to continue their development into full-grown flies. M. E. Roubaud states:

Fresh manure alone plays a part in the production of flies. The laying of eggs even takes place in the stable on the dung impregnated with urine. Oviposition may continue for 24 hours, but never later. Fermentation, after barely 24 hours, definitely protects the manure from the laying of eggs. Antiseptic substances and larvicides (borax, cresol, ferrous and ferric salts), by delaying fermentation, may prolong deposition one or two days. Employed as larvacides, these substances, by prolonging the period of infestation, often

produce a result the very opposite of that intended. From the sixth day manure when placed in a heap does not contain larvæ, these having migrated to the base for nymphosis. Antifly measures, therefore, ought to be taken within five days of the removal of the manure from the stable. Manure 24 hours old at the time of the removal does not contain visible larvæ. The eggs which are disseminated throughout the manure heap then open and the larvæ come to the surface, leaving the central parts as fermentation develops and the temperature rises. On the following day a temperature of 70° C. to 90° C. (158° F. to 194° F.) may be found in the center of the heap. The heat arising from fermentation in a manure heap may be used as a means of destroying the larvæ which it contains. The larva of the domestic fly, protected from the gases of fermentation, dies in three minutes when exposed to a temperature of 50° C. (122° F.). In contact with the gases it dies in one minute at 51° C. (123.8° F.), in five to seven seconds at 59° C. (138.2° F.), and four to five seconds at 60° C. (140° F.).

When a manure heap is turned over the larvæ which come in contact with the hot parts in the interior are killed at once. A complete stirring up of the manure on the day after the deposition, and repeated on the two following days, causes a disappearance of 90 per cent of the larvæ. This operation is more easily and quickly done if, instead of waiting until the infected heap has itself produced the necessary temperature, it is exposed to the heat of a heap previously fermented. For this purpose, instead of placing the new manure on the surface of the heap as is usually done, it should be buried in the hot parts by covering all its surfaces with a layer of hot manure 20 centimeters thick. In four or five hours the new manure may be considered as entirely free from eggs and larvæ, which would otherwise have developed in thousands. This biological method of delarvization by heat is equivalent to the heating of the whole of the fresh manure to a temperature of 50° C. (122° F.) to 60° C. (140° F.), and is effected without apparatus and without fuel. It is within the reach of all, and only a simple training of the personnel is required. In practice it is found that the mass of fermented manure required to furnish the necessary temperature is about eight times that of the fresh manure to be treated. Next day this may be used in its turn as a source of heat. The biothermic method of treating fresh manure can alone destroy quickly and cheaply the eggs and larvæ in a manure heap.

"Swat the fly" campaigns will not eliminate flies unless other measures are taken. They do more good in the early part of the season. Dwellings, markets, and bakeries should always be carefully screened, and where it is not possible to screen the buildings food supplies should not be exposed unless they are protected by netting. Large flytraps, placed in localities where flies are abundant, have been found to be useful in diminishing their number. Various forms of these traps are used, one of which is shown in figure 38. Howard states that—

Manure boxes with flytraps attached (see fig. 39) should be used by all stock owners in towns and cities, and they are also adaptable to farms. The size of the manure bin should be governed by the individual needs, but for use on the farm it is desirable to make it large enough to hold all of the manure produced during the busiest season of the year. A box 14 feet long, 10 feet

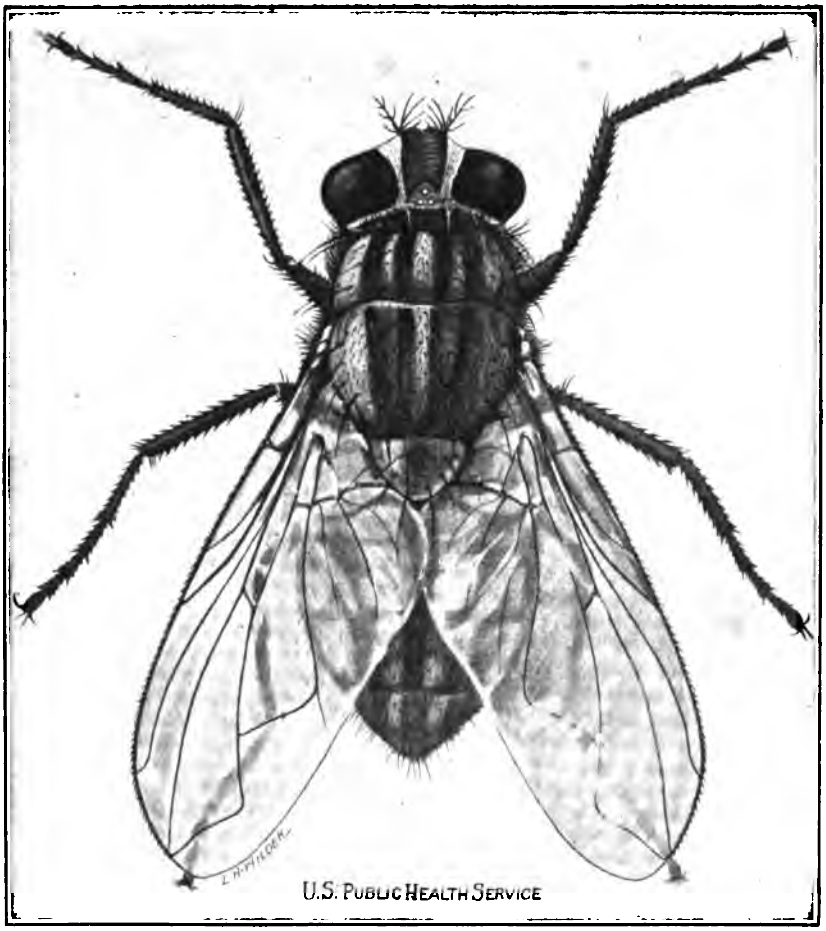


FIG. 32.—The house fly.

FIG. 34.—Mass of larvæ in stable manure. (After Graham-Smith.)

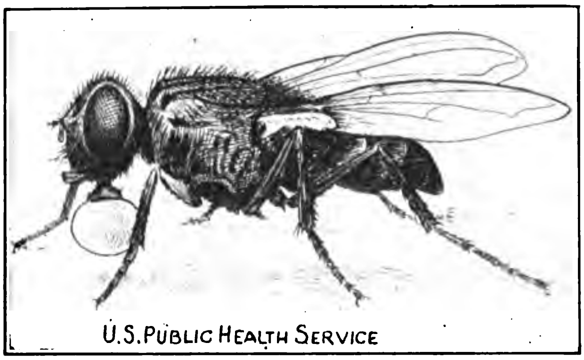


Fig. 35.—House fly regurgitating liquid material. (After Hewitt.)

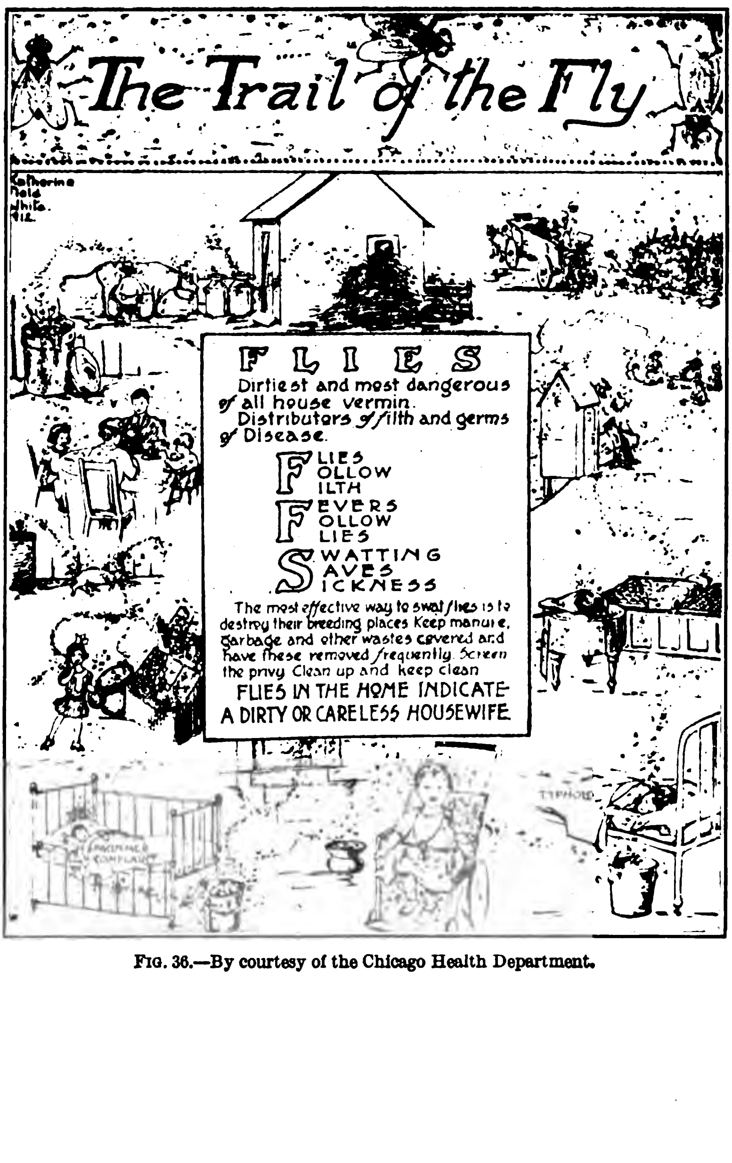


Fig. 36.—By courtesy of the Chicago Health Department.

wide, and 4 feet deep will hold the manure produced by two horses during about five months. About 2 cubic feet of box space should be allowed for each horse per day. The bin should be made of concrete or heavy plank. When the latter is used the cracks should be battened to prevent the escape of flies. The bin may have a floor or it may be set in the ground several inches and the dirt closely banked around the outside. For the admission of the manure a good-sized door should be provided in either end of a large bin. A portion of the top should be made easily removable for convenience in emptying the box, or one entire end of the box may be hinged. On account of the danger of the door being left open through carelessness, it is advisable to arrange a lift door which can be opened by placing the foot on a treadle as the manure is shoveled in. The door should be heavy enough to close automatically when the treadle is released.

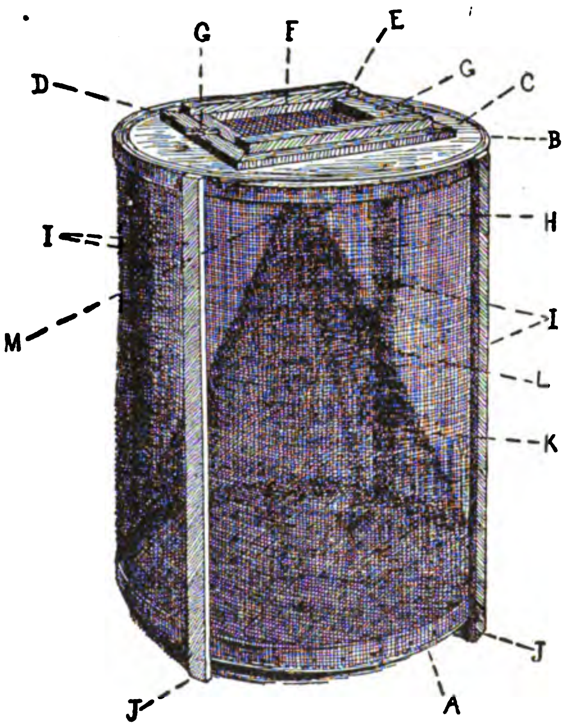


FIG. 88.—Conical hoop flytrap; side view. *A*, Hoops forming frame at bottom. *B*, Hoops forming frame at top. *C*, Top of trap made of barrel head. *D*, Strips around door. *E*, Door frame. *F*, Screen on door. *G*, Buttons holding door. *H*, Screen on outside of trap. *I*, Strips on side of trap between hoops. *J*, Tips of these strips projecting to form legs. *K*, Cone. *L*, United edges of screen forming cone. *M*, Aperture at apex of cone. Bishopp.

In buildings where flies are not very abundant, sticky fly paper is fairly efficient in reducing their number. A solution containing three teaspoonfuls of sodium salicylate in one pint of water may be placed in saucers around the room, and it will be found that many flies will be killed by drinking thereof. It is necessary, however, to remove other liquids from the room. Care should be taken to see that children and animals do not drink the water, as sickness may result therefrom. This solution may be placed in a tumbler and the latter inverted over a piece of blotting paper in a dish. The solution gradually oozes through the blotting paper upon which the tumbler rests and thus becomes accessible to the flies.

Mosquitoes.

Most mosquitoes lay their eggs upon the surface of water. In some species these adhere together in raft-like masses. In summer time the larvæ, or "wiggle tails," hatch in one or two days. Although they live in water, they must, with the exception of one unimportant species, either lie on its surface or come frequently to the surface to breathe. In a few days the larvæ change into pupæ, or "tumblers," from which the winged insect emerges through a rent in the pupa case and flies away. The whole process, from the

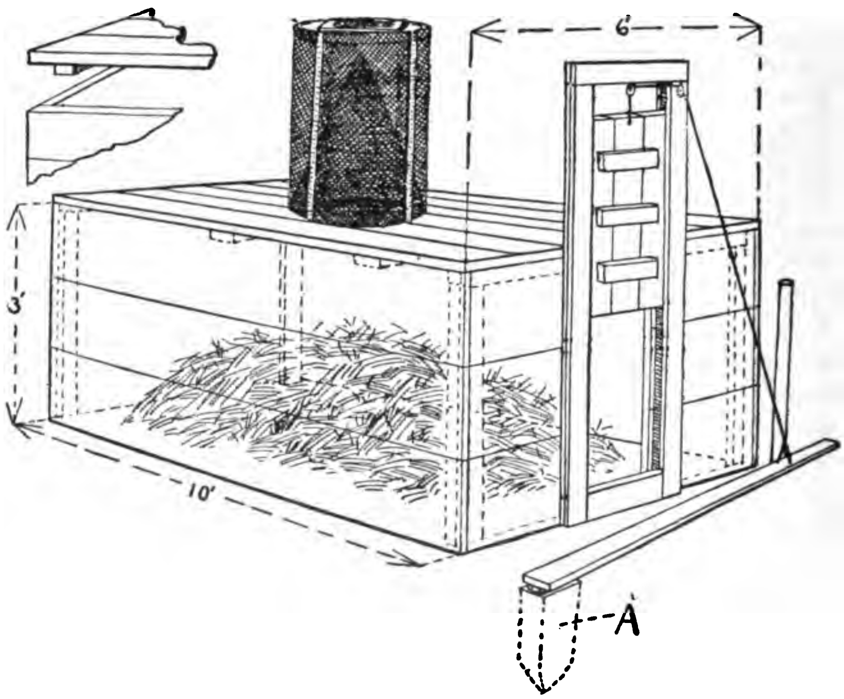


FIG. 39.—Use of flytrap in connection with manure bin. A, Block of wood set in ground to which lever raising door is hinged. Bishopp.

laying of the egg to the emerging of the adult insect, requires from 9 to 15 days, or, if the water is cold, sometimes as much as 22 days. Some species hibernate in the egg form.

The different parts of an adult mosquito are shown in figure 42. There are a number of species of mosquito, each varying slightly from the other. Only female mosquitoes are blood-sucking insects; male mosquitoes are vegetarians and do not bite man or animals. For some species blood appears to be necessary to the female mosquito for the full development of its eggs.

The breeding places of mosquitoes depend to a great extent upon the species. The yellow-fever mosquito and the domestic mosquito

FIG. 37.—Mass of eggs of house fly, *M. domestica*. (From Gordon Hewitt.)

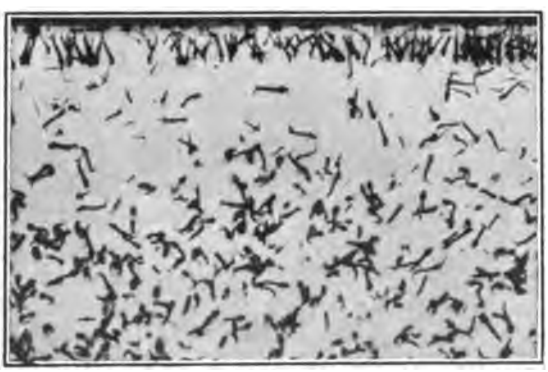


FIG. 40.—Mosquito "wigglers;" larvæ and pupæ in the water. Life size.

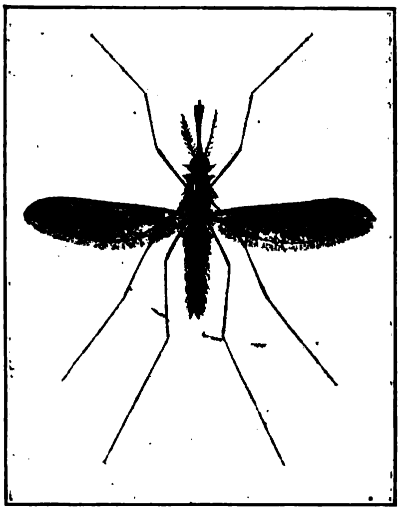


Fig. 43.—Anopheles maculipennis (quadrimaculatus), female. (Castellani and Chalmers, after Austen.)

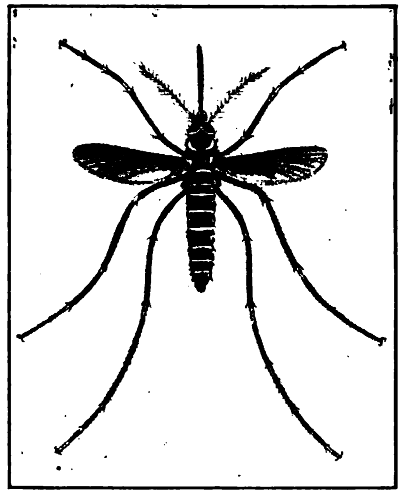


Fig. 45.—Aëdes calopus, female.

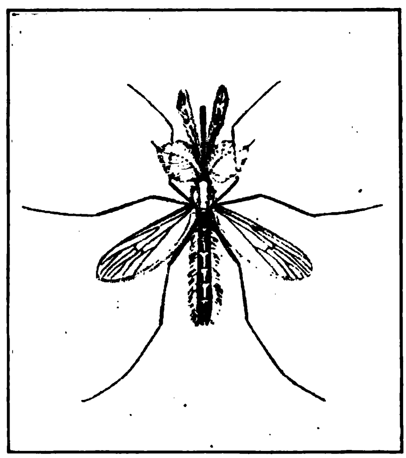


Fig. 46.—Culex pungens, male. (After Howard.)

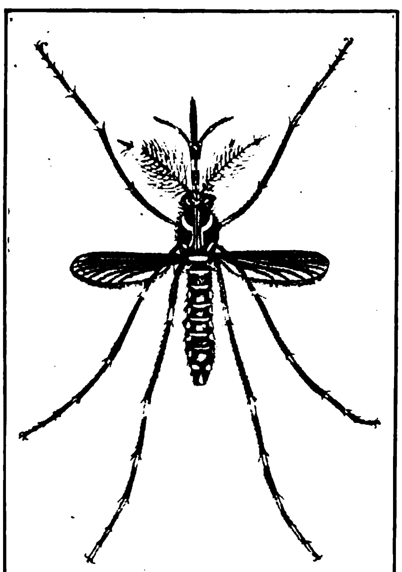


Fig- 44.—Aëdes calopus, male.

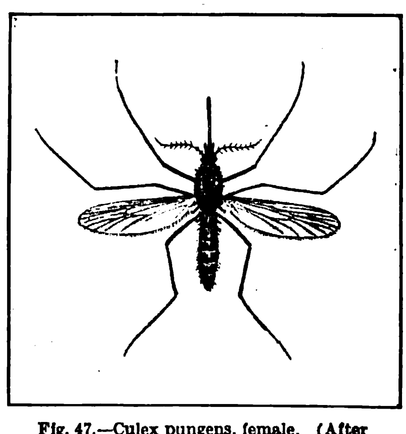


Fig. 47.—Culex pungens, female. (After Howard.)

breed around houses, in any small collection of water that may be present in tin cans, bottles, flowerpots, pools, gutters, sewers, etc. Malarial mosquitoes may be found breeding in such places, but this mosquito usually prefers the margins of ditches and lakes, especially where reeds and water plants are found, as in swamps and low bottom lands. Near the seacoast there are other mosquitoes which breed only in brackish water, but these, although annoying, do not transmit disease to man. Mosquitoes may be blown many miles by the wind, but it is not usual to find those that transmit disease very far from their breeding places. The presence of mosquitoes in a house is good evidence that they are breeding in some place near the house, and very often a search will be rewarded by the finding of wiggle tails in some small collection of water. They are often carried by trains and boats for long distances, and the spread of yellow fever from one country to another is accounted for to a great extent by infected mosquitoes being carried in this way. During the winter some species of mosquitoes hibernate in cellars and dark corners; in others, the larvæ or eggs resist cold, and they even hatch out after being frozen.

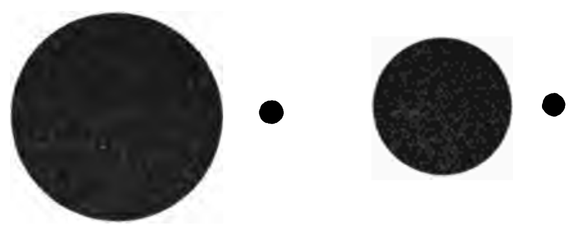


FIG. 64.—The effect of mosquito eradication in Habana on yellow fever (right) and malaria (left).

The diseases known to be transmitted by mosquitoes are malaria, yellow fever, dengue, and filariasis. Three conditions are necessary before these diseases can be spread from one person to another. First, a person must be bitten by a certain kind of mosquito—malaria is only transmitted by Anopheles mosquitoes; yellow fever by a striped black and white mosquito called *Aedes calopus;* a mosquito known as the *Culex fatigans*, and probably some others, are believed to carry the germs of dengue; while filariasis is spread by several varieties of mosquito. Second, the mosquito must have been infected by previously biting some person who has the germ of the disease in his blood. Third, some time, varying with the different diseases, for some not less than 8 or 10 days, must elapse between the time the mosquito bites the person suffering from the disease and the biting of the well person. The reason for this, in the case of malaria, is explained by Surgeon Carter as follows:

If the mosquito sucks up only sexless parasites with the blood she will not become infected, no matter how many she takes. If, however, the proper kind of mosquito takes up the male and female forms of the parasite they join together in her stomach and pass into her stomach wall, where they grow. After some time the bodies thus formed break and set free many young parasites,

some of which finally find their way to the mouth of the mosquito. There the parasites are mixed with her saliva and are injected into a man when she bites him; then they enter the blood cells and start their life all over again.

Eradicative measures.—As it is impossible to tell, except by careful examination, which mosquitoes are capable of conveying diseases to man, it is necessary that measures be taken not only to diminish the inumber of mosquitoes but also to prevent them from biting persons, so far as it is practicable to do so. It is especially important that mosquitoes should not be allowed access to a person suffering from a disease which may be conveyed by them, as one of them may become infected by biting the sick person and thus transmit the disease to others. The subject of the eradication of such diseases, therefore, divides itself into two portions—the first is the protection of the body from the mosquito, and the second the elimination of breeding places or such treatment of them as will render them unsuitable for that purpose.

All buildings at places infested with mosquitoes should be screened. A description of the methods used for this purpose will be found on page 18. The house should be searched each morning for mosquitoes which may have gained entrance through cracks and other places not properly protected, as otherwise the house becomes a mosquito trap; the mosquitoes simply hide, and during the night attack the people dwelling therein.

No water should be allowed to stand in containers around the dwelling. Empty cans and bottles in which rain water may collect at any time should be taken away. The grass should be cut short in order that it may not serve as a hiding place for mosquitoes, and a screen of trees should be planted some distance from the house between it and any mosquitoe breeding place, such as a lake or swamp, that may be near by. Low places in the ground should be drained by ditches. Open ditches should be made with sufficient fall to prevent the collection of small puddles of water in the bottom; it is best to line them with cement. In many places subsurface drains may be employed (fig. 62), in which the drain is put in the ditch after it is dug and the ditch then filled with loose rock. Cisterns and rain barrels must also be screened or a film of oil must be kept upon their surface. The oil prevents the wiggle tails from coming to the surface to breath. The reeds and plants around the edge of streams and lakes should be cut away, in order to allow fish, which feed upon the larvæ of mosquitoes, to gain access to them. Streams not having fish should be stocked with the kinds that feed on the larvæ, a little fish known as the kilifish or any kind of "top minnow" being especially valuable for this purpose.

Oil may be used as a temporary measure to prevent the breeding of mosquitoes. It should be spread as a fine film over the surface

FIG. 41.—Dipping water from a rain barrel to look for mosquito larvæ.

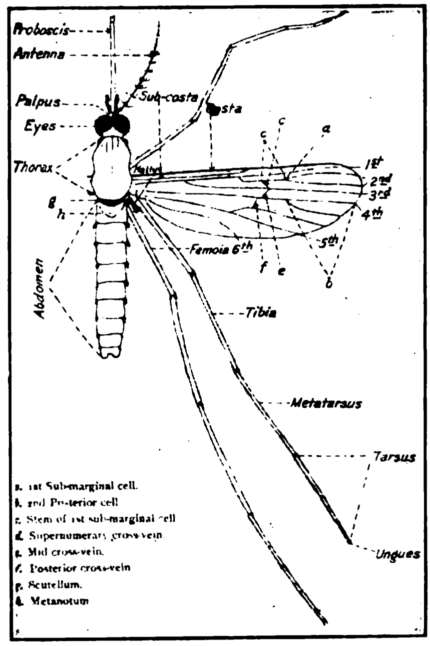


FIG. 42.—Diagram of mosquito, showing parts. Note.—The part of the leg marked "metatarsus" is in reality the first tarsal joint; both terms are used.

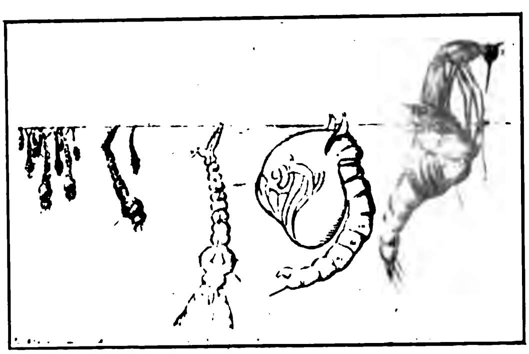


FIG. 59.—*A* is a mosquito larva; *B* is a pupa; *C* is an adult mosquito coming out of an old pupa.

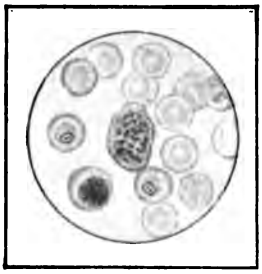


FIG. 48.—Normal red blood cells, and red blood cells containing malarial parasites.

Fig. 50.—Resting posture of mosquitoes: 1 and 2, Anopheles; 3, Culex pipiens. (After Sambon.)

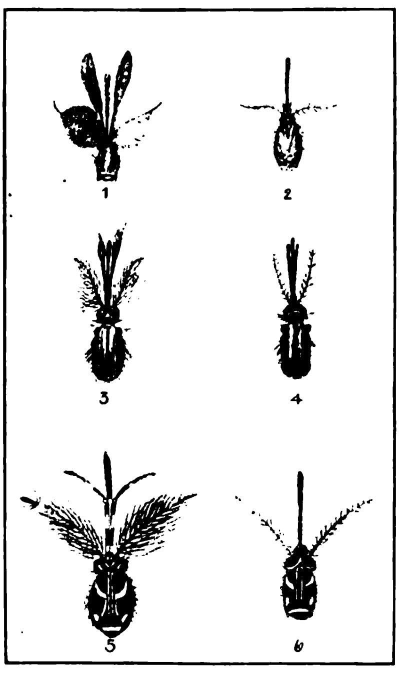


Fig. 49.—Heads of mosquitoes: 1 and 2, male and female Culex pungens; 3 and 4, male and female Anopheles; 5 and 6, male and female Aëdes calopus. (After Stitt.)

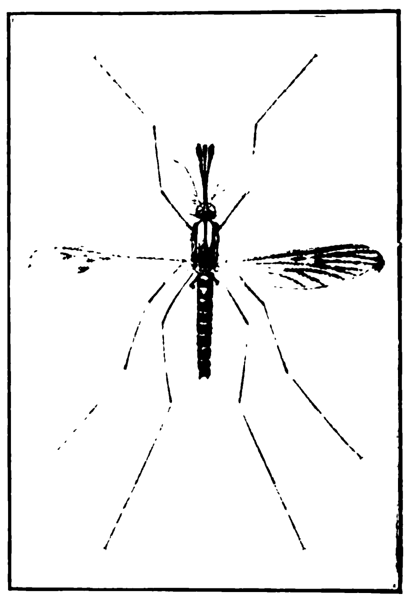


Fig. 51.—Anopheles maculipennis (quadrimaculatus), male. (After Castellani and Chalmers.)

of the water, a light oil being best adapted for this purpose. In a slow-running stream oil may be used by allowing it to drip slowly from a container placed at the source of the stream. It requires about an ounce of oil for each 15 square feet of surface, and the oil has to be renewed several times a month. The oiling of streams to prevent breeding of mosquitoes is not very satisfactory, as wind will often blow the oil to one side and leave a large surface of the water free for breeding purposes. In Panama a better result was obtained by using a larvicide, which was made as follows: One hundred and fifty gallons of crude carbolic acid having a specific gravity not greater than 0.97 and containing not less than 30 per cent tar acids, is heated in an iron tank with a stream coil to a temperature of 212° F., then 200 pounds of powdered or finely broken common resin is poured in. The mixture is kept at a temperature of 212° F. Thirty pounds of caustic soda dissolved in 60 gallons of water are then added, and the solution is kept at the same temperature until a perfectly dark emulsion without sediment is formed. The mixture is thoroughly stirred from the time the resin is added until the end. One part of this emulsion to 10,000 parts of water is said to kill Anopheles larvæ in less than half an hour, while 1 part to 5,000 parts of water will kill them in from 5 to 10 minutes. The Panama larvicide is mixed with 5 parts of water and sprayed upon pools or along the banks of streams. This larvicide added to 5 parts of crude petroleum favors its spread upon the surface of the water. A good method is to place the mixture in a barrel and permit it to drip upon the surface of the stream or pond to be treated.

Senior Surgeon Carmichael advises the use of pine tar and castor oil to prevent attacks of mosquitoes. One ounce of pine tar is thoroughly mixed with 6 or 8 ounces of castor oil, and then applied freely to the face, neck, hands, and arms. Dr. Carmichael states that a much smaller proportion of pine tar may be used without impairing the efficiency of the mixture.

This solution makes a dirty mixture that will soil the clothing if brought into contact with it, but it prevents mosquitoes from biting and does not injure the skin. It is readily removed by hot water and soap.

Fleas.

Fleas are small insects which have no wings, but get from one place to another by leaping or by being carried by their host. The popular idea that fleas can leap long distances is erroneous. The distance jumped is never over six inches. Fleas are brought into dwellings by domestic animals. They lay their eggs in the fur of the animal, but the eggs fall off to the floor, as they are not fastened to the hairs, and become mixed with the dust on the floor.

The eggs hatch in about five days, and the larvæ probably feed upon the organic matter present in the floor dust. They moult their skin several times and finally spin cocoons in which they change to a pupa state. In a few days the cocoons split open and the adult insects emerge.

Fleas are principally of interest on account of their ability to convey plague. This disease may be transmitted by the cat flea (*Ctenocephalus felis*), the human flea (*Pulex irritans*), the squirrel flea (*Ceratophyllus acutus*), the rat flea (*Ceratophyllus fasciatus*), and probably other species. The rat flea is, however, the chief one concerned in conveying the disease to man. It has been contended that the rat flea would not readily bite man, but experiments have proven that it will, under certain conditions, especially if its natural food supply is scarce, and that it may convey the germs of plague, obtained by biting a rat suffering from the disease as long as three weeks.

A house may be rid of fleas, or at least their number may be greatly diminished, by sprinkling flaked naphthalene on the floors and leaving the rooms closed for a number of hours. Water will destroy the larvæ, but has little effect upon the adult fleas. Kerosene will kill them, and also sulphur fumes obtained by burning sulphur in pans (see p. 65) may be used for this purpose. Chloroform is useful in killing fleas on the body, as it may be poured through the clothing directly on the spot where the flea is located.

Lice.

Lice are small, round, flat insects which fasten themselves to the hair of warm-blooded animals, and, in the case of man, not only to the hair of his body but also to the clothing he wears. The eggs, called nits, can be seen in the hair as small white specks. They are difficult to remove on account of the sticky substance with which they are attached.

Three kinds of lice infest human beings, the *Pediculus capitis* or head louse, the *Pediculus vestimenti* or body louse, and the *Phthirius pubis* or crab louse. They cause itching and burning, and in some cases severe inflammation of the skin with the formation of sores. Crusts, interspersed with bleeding areas, may be present. The body louse, and possibly the head louse, transmits typhus fever, and perhaps other diseases from one person to another.

Every effort should be made to free the body from lice and their eggs if one should be so unfortunate as to become infested with these insects. The head louse is destroyed by washing the hair with a mixture of equal parts of kerosene and vinegar, care being taken that it does not run down over the face or neck. The vinegar dis-

Fig. 52.—A raft of Culex ova. (After Deaderick.)

Fig. 53.—Patterns assumed by Anopheles ova. (After Deaderick.)

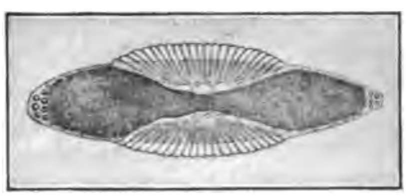


Fig. 54.—Egg, Anopheles maculipennis (quadrimaculatus). (After Ludlow.)

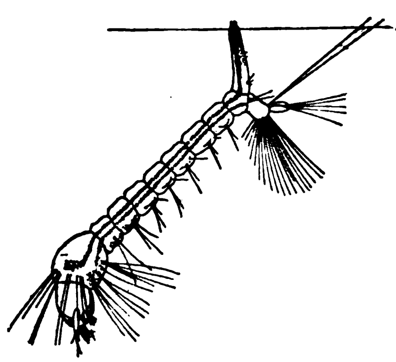


Fig. 55.—Larva of a Culex mosquito. (After Howard.)

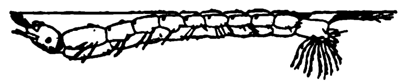


Fig. 56.—Larva of Anopheles mosquito. (Castellani and Chalmers. Modified after Howard.)

Fig. 57.—Larva of Anopheles maculipennis (quadrimaculatus). (Castellani and Chalmers, after Nuttall and Shipley.)

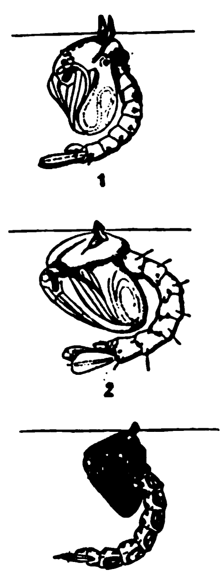


Fig. 58.—Pupae: 1, Culex; 2, Anopheles; 3, Aëdes calopus. (After Howard.)

Fig. 62.—Showing clearing and ditching done.

Fig. 63.—Ditching of low area of pool formed by seepage water. Malaria prevailed among tenants in all houses.

solves the sticky substance which binds the nits to the hair, and the kerosene kills the lice. Gasoline is as efficient as kerosene, but it should not be used, as its inflammability is much greater than kerosene. The danger of burning a patient in case either of these preparations is employed should be borne in mind, and the patient should be outdoors at the time of application and remain outside until the hair becomes dry. Several applications at intervals of two or three days are required, as the nits, or eggs, are hard to kill. These may sometimes be combed from the hair with a fine-toothed comb. The body louse lives in the clothing, so this should be boiled or baked. If this is impossible the clothing, and especially the seams, should be ironed with a hot iron. An efficient method is to soak the clothing in gasoline, or the vapor of gasoline may be forced through them. Another less expensive method is to put the clothes for half an hour in a soapy solution to which 2 per cent of trichlorethylene has been added. A good application to the body is a solution made by mixing 1 part of gasoline with 3 parts of vaseline. This preparation is noninflammable under working conditions. An ointment made by mixing 5 parts of naphthalene with 95 parts vaseline is also useful for this purpose. Pubic lice, commonly known as "crabs," are destroyed by the application of white precipitate, or mercurial ointment.

Lenz found that he could eradicate lice from prisoners at Puchheim (near Munchen) by means of finely powdered naphthalene. A handful of this material is put into the patient's clothing, introduced through the opening at the neck. He is made to sleep at night with all his clothes on. The body heat causes the naphthalene to evaporate, the vapor killing not only the lice but also most of the eggs. This treatment should be repeated every 4 days for a period of 12 days.

In the British Army a powder composed of naphthalene (96 parts), creosote (2 parts), and iodoform (2 parts) is used. About two-thirds of 1 ounce is required for each man. Two tablespoonsful of an ointment made of crude mineral oil (9 parts), soft soap (5 parts), and water (1 part) is rubbed into the interior seams of the clothing. Articles of underclothing are treated by dipping and wringing them out in a solution of 1 per cent each of naphthalene and sulphur in benzene or gasoline.

Itch Mite (Sarcoptes Scabiei).

The itch mite is a small parasite which burrows into the skin and produces a disease known as the itch or scabies. The irritation produced by the mite causes scratching, which results in excoriations, papules, and pustules at places where the mite has entered.

Prevention.—A person with the itch should be careful not to shake hands with other persons. He should use separate towels and sleep in a bed by himself. He should, as far as possible, keep away from other people, particularly children, as they are especially susceptible to the disease.

Treatment.—The patient should take a hot bath, using plenty of soap, and an ointment composed of powdered sulphur (2 teaspoonsful) and vaseline (8 tablespoonsful) should then be well rubbed into the skin. The treatment is continued for three nights, and on the morning of the fourth day the patient takes a bath and puts on clean clothing. If there is burning of the skin, a little zinc ointment may be rubbed in. The underwear and bed clothing should be boiled and the outer clothing ironed or baked. The treatment should be repeated after an interval of three or four days if itching is still present. Another method of treatment is to rub the body with powdered sulphur every night for a week after taking a bath and also sprinkle it between the bed sheets at night and on the underwear during the day. The sheets and underwear should be changed each day.

Ticks.

Ticks are believed to feed upon blood alone. They attach themselves to the skin of man and animals and partly burrow into it. They hold on tenaciously. If carelessly pulled off, the head may be torn from the body and remain in the skin. The eggs of ticks are deposited upon the ground. The larvæ are six-legged creatures which catch hold of any animal within their reach. After becoming engorged with blood the larva drops off and changes to the third or nymph stage. The nymph, after obtaining more blood and shedding its skin, changes to the adult insect. The tick is instrumental in spreading Rocky Mountain spotted fever throughout some parts of the country. It should be removed from the skin by means of hartshorn, kerosene, turpentine, or carbolized vaseline, which prevent the head remaining in the skin. Persons traveling through woods or other places in a tick-infested country should stop and search their bodies every two or three hours and remove any ticks that may have attached themselves thereto.

Bedbugs.

The presence of bedbugs in dwellings is indicative of want of care and cleanliness as to bed, bedclothes, etc., and means should be taken to exterminate them when they appear. A liberal application of kerosene oil to the places infested is probably the best means of killing them. There are preparations of gasoline or naphtha sold which leave no stain when sprayed on painted or papered walls.

FIG. 60.—Vegetation along the side of drainage ditches may be easily burned if saturated with crude oil.

FIG. 61.—A garbage can having a hole in the bottom through which is passed a wick automatically feeds oil into ditches where mosquitoes might breed.

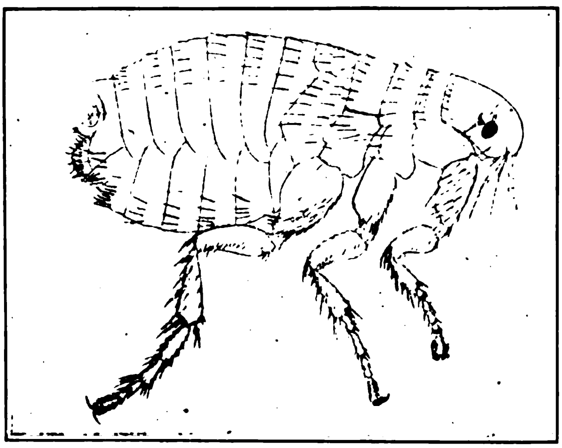


FIG. 65.—Flea.

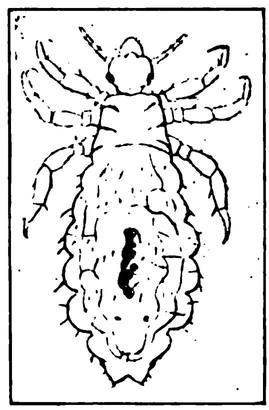


FIG. 66.—Body louse (*Pediculu corporis*). Magnified 20 times.

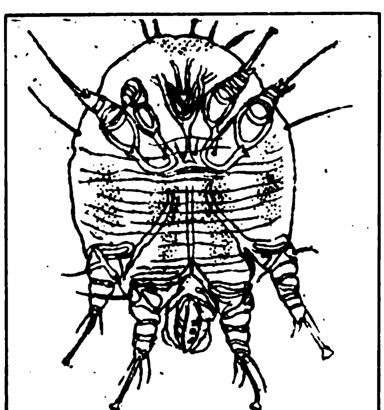


FIG. 67.—Itch mite (*Sarcoptes scabiei*). Male. Ventral view. The sucker on the fourth leg on the right is accidentally folded over the third leg. (From Bourguignon.)

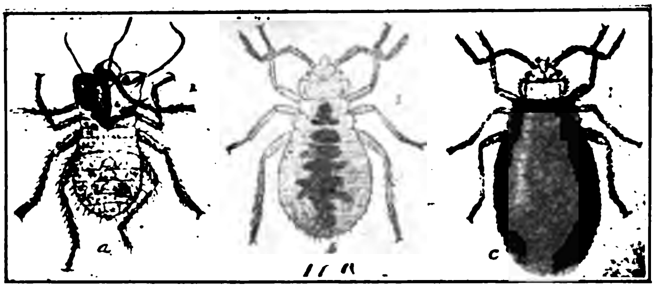


FIG. 68.—Bedbug (*Cimex lectularius*): *a*, Larval skin shed at first molt; *b*, second larval stage taken immediately after emerging from *a*; *c*, same after first meal, distended with blood. Greatly enlarged.

FIG. 69.—Fumigating gas for destruction of rats being pumped into hold of vessel. Plague eradicative campaign, New Orleans, 1914.

FIG. 70.—An insanitary barn.

Badly infested rooms may be freed from bedbugs by fumigating with sulphur, using 2 pounds of sulphur to every thousand feet. The method of disinfecting with sulphur is described on page 65.

Roaches.

Roaches are believed to be responsible for the conveyance of tuberculosis, diphtheria, typhoid fever, tonsillitis, and possibly some other diseases. They spread these diseases by carrying the organisms on their feet and in their intestinal canals and disseminating them over food supplies, books, and other articles in daily use. They are especially abundant in the galleys of vessels and in damp kitchens. They appear at night after the lights have been turned off and overrun everything in the room. Roaches can be quickly, cheaply, and completely exterminated from ships and houses by the use of sodium fluorid. This should be spread with a rubber powder blower on the floors near the walls and on shelves in closets. The powder does not suffocate the insects, but sticks to their feet. They clean it off with their mouths, some of it being swallowed and causing the death of the insect. As sodium fluorid is poisonous to man in doses of a tablespoonful or more care should be taken not to spread it over articles that are to be eaten.

SANITATION OF VESSELS.

Construction.—Section 2 of an act of Congress entitled "An act to promote the welfare of American seamen in the merchant marine of the United States," etc., approved March 4, 1915, reads as follows:

SEC. 2. That on all merchant vessels of the United States the construction of which shall be begun after the passage of this act, except yachts, pilot boats, or vessels of less than one hundred tons register, every place appropriated to the crew of the vessel shall have a space of not less than one hundred and twenty cubic feet and not less than sixteen square feet, measured on the floor or deck of that place, for each seaman or apprentice lodged therein, and each seaman shall have a separate berth and not more than one berth shall be placed one above another; such place or lodging shall be securely constructed, properly lighted, drained, heated, and ventilated, properly protected from weather and sea, and, as far as practicable, properly shut off and protected from the effluvium of cargo or bilge water. And every such crew space shall be kept free from goods or stores not being the personal property of the crew occupying said place in use during the voyage.

That in addition to the space allotment for lodgings hereinbefore provided, on all merchant vessels of the United States which in the ordinary course of their trade make voyages of more than three days' duration between ports, and which carry a crew of twelve or more seamen, there shall be constructed a compartment, suitably separated from other spaces, for hospital purposes, and such compartment shall have at least one bunk for every twelve seamen constituting her crew, provided that not more than six bunks shall be required in any case.

Every steamboat of the United States plying upon the Mississippi River or its tributaries shall furnish an appropriate place for the crew, which shall conform to the requirements of this section, so far as they are applicable thereto, by providing sleeping room in the engine room of such steamboat, properly protected from the cold, wind, and rain by means of suitable awnings or screens on either side of the guards or sides and forward, reaching from the boiler deck to the lower or main deck, under the direction and approval of the Supervising Inspector General of Steam Vessels, and shall be properly heated.

All merchant vessels of the United States, the construction of which shall be begun after the passage of this act, having more than ten men on deck must have at least one light, clean, and properly ventilated washing place. There shall be provided at least one washing outfit for every two men of the watch. The washing place shall be properly heated. A separate washing place shall be provided for the fireroom and engine-room men, if their number exceed ten, which shall be large enough to accommodate at least one-sixth of them at the same time, and have hot and cold water supply and a sufficient number of wash basins, sinks, and shower baths.

The sides of an iron ship are cold and anyone sitting or sleeping near them becomes chilled. In order to prevent this, spaces used for quarters should have the outside walls sheathed with plating, an air-tight space being left between the side plates of the ship and this plating. If the space is not air-tight the circulation of air within will cause sweating. The inside of this space should be lined with cork or asbestos or painted with cork paint.

Ventilation.—The ventilation of sailing ships is simple. All they require are a few air ducts leading from the deck to the forecastle cabin and galley. These ducts end in cowls, which can be turned to the wind to admit air into the compartments or away from the wind to draw it out. On steam vessels provision has to be made for removing the large amount of air heated by radiation from the surface of boilers and steam and hot-water pipes. This heat is called "wild heat," as it serves no useful purpose. There must be a number of large size ventilating pipes and fans or other apparatus employed throughout the ship to draw cold air in and force hot air out. The drawing in of the air is the more important, as a large part of the hot air is used in the combustion of fuel and escapes through the smoke-stack. The fireroom is said to be more comfortable in assisted draft. In this condition the natural intakes are closed and the air is drawn through the ventilators into the fireroom by fans. The hot air leaves by the same openings as in natural draft. Gatewood says:

In order to diminish the temperature in firerooms and thus improve the conditions under which the men work, the use of assisted draft is becoming much more common, and by reducing number of fires it seems not improbable that the expenditure of coal may thus be made as economical under assisted draft as under natural draft at ordinary cruising speed.

On passenger and war vessels there must be a system of ventilating pipes extending to all parts of the vessel, connected to fans operated by electric motors; the fresh air should be driven into the living

quarters and the stagnant air drawn out of places such as the galley, bathrooms, and water-closets. If some such system of ventilation were not provided, conditions aboard these vessels would be unbearable.

The temperature in the fireroom often rises as high as 130° F. The temperature and humidity of the fireroom should, if possible, be regulated so as to prevent the wet-bulb thermometer from rising above 81° F. Firemen, while on duty, should be allowed plenty of ice water. If no ice water is obtainable, oatmeal water should be provided. A water butt should be placed where the men can easily get to it. When coming out of the fireroom into the cold outer air the men should protect themselves with adequate clothing and not rush out in undershirt and overalls. Owing to their carelessness in this respect, men of this class are subject to frequent colds, rheumatism, and kidney disease. They should spend at least 2 hours of the 24 on deck. The hours spent in the hot furnace room makes them "tender" to even a moderately cold atmosphere and it is difficult to induce them to spend a sufficient time in the open air. This applies also to cooks, stewards, and all persons whose work is inside the ship.

Water.—The safest water to use on board a vessel is that provided by distillation. When it is not possible to have distilled water, great care should be exercised to procure water that has not been contaminated by sewage. An act of Congress approved June 4, 1914, states that—

No person, firm, or corporation shall furnish water for drinking or cooking purposes to any vessel in any harbor of the United States intending to clear for some port within some other State or Territory of the United States, or the District of Columbia, taken from the waters of such harbor or from any other place where it has been or may have been contaminated by sewer discharges: *Provided*, That water in regard to the safety of which a reasonable doubt exists may be used if the same has been treated in such a manner as to render it incapable of conveying disease, and the fact of such treatment is certified by the interstate sanitary officer, or the State or other health authority within whose jurisdiction it is obained.

In foreign ports water of known purity should be obtained if possible; if not, the water taken aboard should be treated by adding a teaspoonful of chloride of lime, taken from a freshly opened tin, to each 512 gallons. Whenever practicable, the ship should be brought alongside of the wharf to receive water, as water obtained from water boats is notoriously bad, for even when the water is supplied from a source of unquestioned purity the men on these boats are careless in handling it and pollution results. In many cases if the owners of these boats are not watched they will pump water directly out of a contaminated stream into the tanks of the vessels they are supplying.

Everyone on board a vessel should be provided with a separate towel, soap, and drinking cup for his individual use in order to

prevent conveyance of disease from one person to another. Water butts should have spigots and tight-fitting tops secured by lock and key to prevent seamen from dipping their cups into the water.

Every vessel should carry at least sufficient water to provide 6 gallons per day for each seaman and 10 gallons per day for each fireman aboard.

Ice used for cooling water should be clear, natural ice or ice made from distilled water or water certified as aforesaid, and before the ice is placed in the water it shall be first carefully washed with water of known safety and handled in such manner as to prevent its becoming contaminated by the organisms of infectious or contagious diseases. The foregoing does not, however, apply to ice which does not come in contact with the water which is to be cooled.

Mosquitoes.—The ship should be kept free from mosquitoes. Mosquitoes do not, as a rule, go far from land unless blown by the wind, so, if the vessel is to lie at anchor, a site should be chosen that is sufficiently far from the shore to escape them. When the ship is to lie at the dock or close to the shore, the living compartments should be protected by screens or wire netting of 18-mesh wire placed over the portholes, skylights, and ventilators. Closely fitting screened doors, with springs to shut them after being opened, should be provided. Mosquito bars may be used over bunks, but these are nothing like as efficacious as screening. Mosquitoes should be looked for early in the morning and all that are found in the compartments should be killed. They are usually to be found on the screens trying to get out.

Mosquitoes should not be permitted to breed on board. All barrels, water butts, and buckets, and all articles containing water should be kept covered or be screened. A bucket of fresh water without a cover that has been left in an out-of-the-way place and forgotten will provide a breeding place for hundreds of mosquitoes which may remain with the ship during a long voyage if she stays in tropical waters. The water in the bilges of the vessel and in the bottom of lifeboats should be treated with a small quantity of kerosene oil, sufficient to provide a scum over its surface. Wiggle tails come to the surface of the water to breathe and the kerosene forms a film through which they can not pass to get air, and without air they can not live. The oiling should be done at least once a week as long as there are any mosquitoes on board.

Rats come on board ship by way of the mooring lines or gang planks or conceal themselves in parcels or freight. They multiply rapidly, two females having been known to give birth to 180 in a year. They are omnivorous and can maintain themselves for long periods on very little food. They cause great damage to property

FIG. 71.—Vessel properly fended from wharf with rat guards effectively fastened to lines. (Courtesy of Philadelphia Press.)

FIG. 72.—Dirty flanks, a common condition in winter. Flanks become caked with manure, which there is often no thought of removing. This is the source of most of the dirt found in milk in the winter time.

FIG. 73.—A clean, light, airy interior. Milkers at work are dressed in clean white suits and caps. Cows are clean. An ideal place.

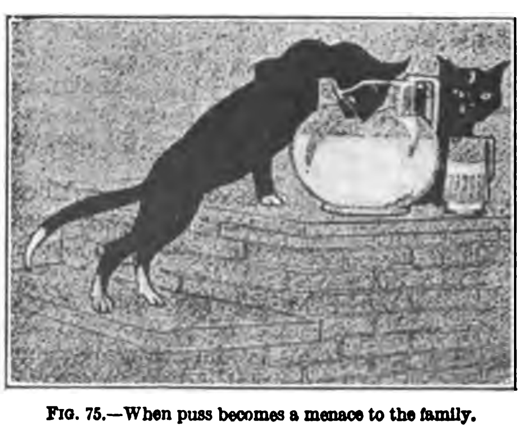


FIG. 75.—When puss becomes a menace to the family.

and freight, and they are a medium by which plague is distributed around the world. The flea transmits the plague bacillus from one rat to another and from the rat to man. It does this by its bite. Vessels should be kept as free from rats as possible. Surgeon Cofer recommends that the following antirat measures be observed by ship captains:

(*a*) Destruction of rats on vessels.

(*b*) Prevention of rats boarding vessels.

To effect the destruction of rats on vessels the latter should be fumigated three or four times a year by sulphur burned in pots.

Almost any kind or size of iron pot will answer the purpose. The ordinary sugar pan 2½ feet in diameter is useful in disinfecting the hold of a vessel or a large compartment, the number of pans to be determined by the number of thousand cubic feet of area to be fumigated. Not more than 30 pounds of sulphur should be placed in each pot. For the fumigation of staterooms and the like the small iron cooking vessels are suitable. Each pot should always be placed in a tub of water, as shown in figure 12.

The tubs should be made of wood or compressed paper, as tubs made of galvanized iron or composition metal go to pieces rapidly through rust or breaks in the seams. The pots should never be placed on the floor of a compartment or bottom of a hold of a vessel. In compartments or storerooms they should be placed upon tables or chairs, and in the holds of vessels either on the "tween" decks, upon piles of ballast, or upon boxes. The sulphur should always be ground or mashed into a powder before being placed in the pots, and should be piled around the sides of the pot with a central depression or crater. Alcohol should always be used for lighting sulphur, although a hot coal will answer the purpose.

One pound of sulphur burned in a space containing 1,000 cubic feet will produce 1 per cent of the gas. Five pounds of sulphur burned in a space containing 1,000 cubic feet will produce 5 per cent of the gas.

On empty vessels burn 2 pounds of sulphur for every 1,000 cubic feet of space and let the gas stand for six hours.

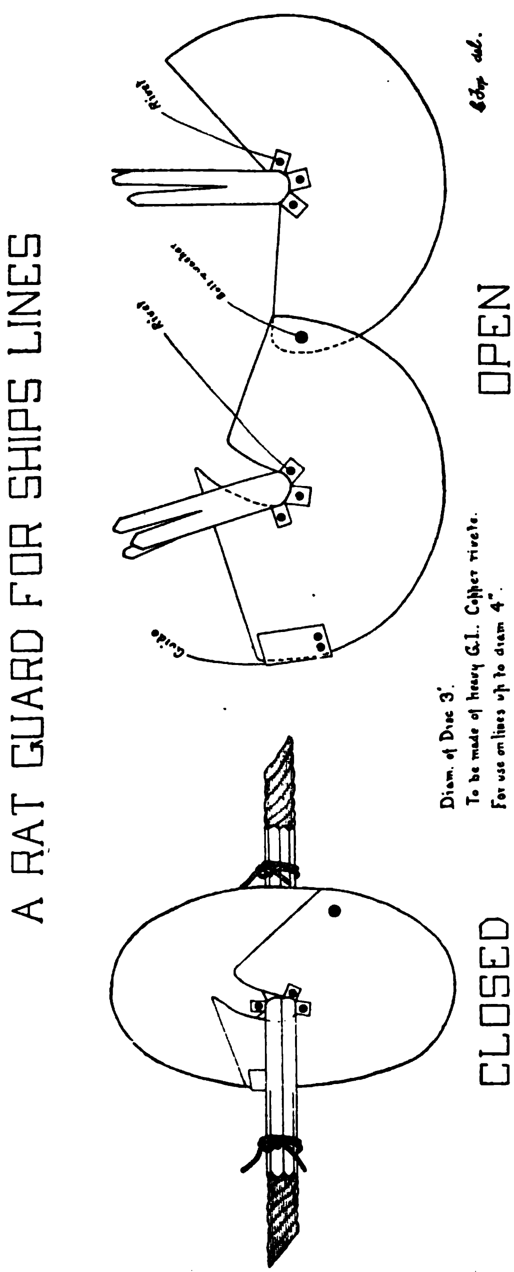
In computing the capacity of the hold of a vessel for the purpose of determining the number of thousand cubic feet of space therein, and therefore the number of pounds of sulphur which will be required to produce a 2 per cent volume of the gas, the net tonnage of the vessel shows in a general way the cubic capacity of her cargo-carrying space. Ten net tons will represent 1,000 cubic feet of space; therefore for every 10 net tons 2 pounds of sulphur must be used to get the average 2 per cent volume strength of sulphur gas. The capacity of the living apartments, storerooms, and the like had best be figured on separately.

In fumigating with sulphur gas all spaces must be made air-tight. In fumigating the holds of vessels the hatches should be covered with their regular waterproof tarpaulins and tightly battened down, leaving a small vent for the escape of the sulphur. All air slits, scuttles, and chain ports should be closed. The doors should be sealed by means of strips of paper pasted over the cracks left between the frame and the door.

If the vessel has cargo the killing of rats should be carried out under the direction of the nearest quarantine officer. After the fumigation is over the rats should be gathered (with the hands protected by heavy gloves) and burned in the ship's furnace or donkey-boiler fire-box, not in the galley.

76912°—19——6

Now, the important thing is to keep the vessel from becoming reinfested with rats. This is effected by (1) the use of rat funnels or guards on all lines while the vessel is in port, (2) by keeping a watch for rats attempting to walk up the gangplank, (3) by keeping a sharp lookout for rats being concealed in loosely crated freight, (4) by keeping the ships' food and stores carefully protected from rats, (5) by distributing rat poison (phosphorus or arsenic paste) in the vessel, (6) by keeping ship's cats (they should not be overfed, else they will not try to catch rats), and, finally, by keeping rat traps constantly set. The following illustration shows what a rat guard looks like:



The special points of this rat guard are these: A single shield in two parts, with arms (funnels) from both sides. It is hinged by bolting at the outside of the shield. There is a guide permitting a perfect fit of the two parts of the disk when closed. It can be used on many different sizes of rope, and when placed on the line fits closely by tying on both sides. Rivets are used throughout, thus increasing the strength. The outside half of the arms is cut lengthwise into three strips so that they may be bent to come into immediate contact with the rope when tied.

The details for making the rat guard are as follows: Flat sheet galvanized iron is used for all parts of the guard; 20 to 24 gauge answers best, for that weight of iron is strong enough and does not make the guard too heavy. The shield should not be less than 3 feet in diameter. The funnel tubes should be 18 inches long on each side of the shield. The central opening can be made to fit any

size of rope. One made for a 3-inch diameter rope will serve for all smaller sizes. When made or used for encircling a number of lines at the same time, the shield should be 4 feet in diameter and the funnel tube enlarged and supported by five flanges and five rivets instead of three. The guide piece, which is the one important feature of this rat guard, is riveted on one side only and then bent around the circumference. The rivets which fasten the funnel tubes go through the tube flanges on each side of the shield. One bolt, two washers, and five rivets are needed for each guard. When badly damaged by use or carelessness, a block of wood and a hammer are all that is required to restore the guard to its former usefulness.

When a ship is in port, especially in a plague-infected port, all gangways should be hoisted at night. The captain of a vessel should insist upon the repeated distribution of rat poison in the warehouses from which his cargo is to be taken. He should in some manner be able to inspect the freight intended for his vessel to guard against rats being taken aboard with loosely crated freight. By loosely crated freight is meant such articles as crockery or china packed in straw or excelsior or furniture or matting wrapped in gunny and loosely crated, also peanuts, rice, sugar, wheat, corn, oats, etc., shipped in bags.

Wherever ships go—plague will go. No rats—no plague.

CAMP SANITATION.

By W. F. Draper,
Passed Assistant Surgeon, United States Public Health Service.

The term "camp" is ordinarily understood to apply to a simple place of abode, somewhat removed from other settlements, and more or less temporary in character. The number of persons which a camp may contain is limited only by its facilities for affording the ordinary requirements of existence.

By its very nature a camp is an independent unit, and every factor relating to the health and comfort of its occupants must receive careful consideration. Unlike the dweller in a city or municipality, the camp dweller will find no system of waste disposal already at hand, nor will there be regulations prescribing the manner in which he shall conduct his affairs for the protection of his own health and that of his neighbors. It is essential, therefore, that persons concerned with the establishment of camps and those who live in them should have a definite knowledge of the principles of sanitation.

The Selection of a Camp Site.

The ground selected must afford good, natural drainage, such, for example, as the top of a low ridge, the summit of a knoll with gently sloping sides, or the high bank of a river. In the case of a large camp, care must be taken that the drainage will not pollute the grounds or water supplies of dwellings or settlements which may be in the vicinity. Low places and swamps should be avoided. The dampness renders them very uncomfortable and in warm weather they usually abound in mosquitoes.

Gravel and sand are excellent soils upon which to establish a camp, as the rain water sinks into the ground and the surface dries rapidly. Mixtures of sand, clay, and loam, while not so good as plain sand or gravel, are usually satisfactory. Clay is perhaps the least desirable constituent of soil for camp purposes. It absorbs and holds a great deal of moisture, which is only slowly given up by evaporation, and is especially disagreeable after a rain.

Trees are highly desirable about a camp, as they afford protection from the sun and wind and are cooling in summer. The foliage should not be so dense as completely to exclude the rays of the sun, for under these conditions the ground may remain moist and the

camp structures may become damp and unhealthful. All underbrush should be thoroughly cleared away from the camp site because in the presence of moisture it affords breeding places for mosquitoes and also gives them protection in their flights. Grass on the camp grounds, when kept closely cut, prevents the washing and gutting of the soil by rains, does not reflect the glare and heat of the sun, and aids in the prevention of mud and dust.

Camp Structures.

Although many different types of camp structures are in use, the tent is perhaps the most common form of shelter. Tents are usually arranged in rows and the space between the tents should be about one and one-half times the width of each tent in order that light and air may have free access.

Ditches should be dug around each tent in order that the floors may be kept dry in wet weather. The sides of the tents should be fastened up during the day when the weather permits so that the sun and air may reach every part of the interior.

The question of the exact number of persons which may properly be assigned to a given space is difficult to answer. As the result of many observations of camps and with a knowledge of the economic problems with which they are confronted the conclusion has been reached that an allowance of 20 square feet of floor space and a distance of 2 feet between each single bed or bunk are the least that can be provided without serious overcrowding. The separation of the beds and economy of floor space may be obtained by the use of double-deck bunks.

Ventilation must be insured by leaving the door flaps, or the sides, or both, open. Tents receive a considerable amount of air through the pores of the canvas; but when the temperature of the inside and outside air is about the same, and in wet weather, when the pores become closed by the contracting canvas, the ventilation may be bad, and openings in the ridge should always be provided.

In places where mosquitoes are numerous the screening of the tents may be necessary. Mosquito bars over the beds, or head nets and gloves may be used.

Beds and bedding should be inspected at regular intervals to insure cleanliness and freedom from vermin. All bedding should be placed out of doors in the sun and air all day at least once a week.

Mess Tent and Cook Tent.

Scrupulous cleanliness should be observed in the cook tent and mess tent and by those engaged in the preparation of the food. Whenever possible, these structures should be screened against flies,

and in cases where this can not be done the food should be protected from fly contamination by means of screened cupboards or covers made from wire mesh. Personal cleanliness is of the greatest importance in the case of those who come in contact with the food, and adequate facilities for washing the hands should be provided. Cooks and waiters should be furnished with white caps and aprons which may be laundered when soiled. The ordinary clothing may come in contact with all sorts of camp wastes and should not be worn during the preparation of the food unless covered with a clean apron.

Water Supply.

Water supplies for camps are generally derived from springs, streams, lakes, or wells.

Although occurring pure in nature, springs may be readily polluted and made unfit for use. The contents of privies, stables, and hog pens may be washed over the surface of the ground by rains and so pollute the spring. Laundry wastes, bath wastes, or filthy material of any kind, if deposited on the surface of the ground near a spring, may carry disease germs into the water. It is of the utmost importance, therefore, that the surroundings of a spring should be kept scrupulously clean, and that no wastes of any sort should be thrown upon the ground.

It frequently happens that spring water is neither sufficient in quantity nor convenient enough in location to furnish a supply for purposes other than drinking and cooking. In such cases additional water is often obtained from other sources, such as rivers or streams, thus creating a double water supply.

When a camp is supplied with a safe water for drinking and cooking purposes, and an unsafe or unknown water for general camp use, certain dangers arise. Many persons are absolutely thoughtless in regard to the water which they drink, and an inferior water, if a little more convenient, will be readily used. Then, too, kitchen help are frequently found to have no very clear understanding as to what extent a doubtful water may be used for cooking purposes and dishwashing. Harmful organisms are killed by boiling, but not all the water used in the preparation of food is sure to reach the boiling point, and much of the water used in washing dishes never boils. The use of a doubtful water, therefore, in the preparation of food or for dishwashing is extremely dangerous, and even its presence in or about the kitchen and eating quarters is very unsafe.

Disinfection of Water Supplies.

Bleaching powder, also known as chloride of lime, chlorinated lime, and hypochlorite, is an efficient and inexpensive disinfectant

and should be applied to all doubtful water at a camp regardless of the purposes for which such water is used. In the quantities for which it is generally employed for the purification of water for drinking purposes it is harmless in its effect upon the human body, and its taste is almost imperceptible.

Bleaching powder rapidly loses its strength when exposed to the air, and great care must be used to keep it tightly covered in air-tight containers.

Directions for the use of bleaching powder in the purification of water for drinking purposes are given on page 34.

Sewage Disposal.

Human excreta must be disposed of in such a way that it will be prevented from dangerously polluting the soil, contaminating water supplies, or furnishing a breeding or feeding place for flies.

The covered can shown on page 38 is a simple means of keeping conditions sanitary. One quart of compound cresol solution (see p. 104) added to 7 quarts of sewage will keep down the odor and destroy disease germs.

When the foregoing instructions are carried out the toilet facilities may be located at any convenient place about the camp, but it is preferable to have them at least 50 feet distant from the eating and sleeping quarters.

Final Disposal of Contents of Can.

As most camps in which such a system of sewage disposal is desirable are located in sparsely populated districts with plenty of vacant land surrounding them, disposal of the excreta by burial may, as a rule, be accomplished satisfactorily. The place selected for the burial should be at least 100 yards away from the water supply, and should not drain toward it.

As the natural agencies of purification are present in the greatest numbers in the upper layers of the soil it is better that excreta should be given shallow burial rather than be thrown into deep pits. The deeper the pit in which it is placed the greater is the danger of polluting underground water supplies.

Instead of the large pits which are frequently found at camps, shallow furrows or trenches should be dug. They should be from 6 to 12 inches deep and the excreta should be scattered along in a layer about 2 inches thick and immediately covered with 6 to 12 inches of earth.

Garbage Disposal.

Covered metal cans should be provided for garbage. The wooden pails, buckets, and barrels so frequently used at camps are unsuitable

containers. They are seldom provided with covers and are difficult to clean. They swell and warp, allowing the liquid portions of the garbage to leak through and saturate the surrounding ground and rapidly go to pieces, often falling apart in the process of dumping.

A metal garbage can of suitable size and with a tight fitting cover can be purchased at almost any hardware store for a sum not exceeding one dollar. Such a receptacle is water-tight and very serviceable; when kept covered it remains free from flies and does not give off disagreeable odors.

Garbage cans should be washed out and scalded with boiling hot water at frequent intervals to prevent them from becoming unnecessarily foul. Moisture is the immediate cause of the souring of garbage, therefore the drier it is the longer it can be kept without being a nuisance. If garbage is drained and then wrapped in paper before being placed in the can it will not smell in hot weather nor freeze and stick to the can in cold weather. The can will not become dirty and will not require emptying more than once or twice a week.

Destruction of both liquid and solid garbage wastes by fire is far preferable to any other means of disposal and gives absolute security.

A very simple type of incinerator may be constructed by digging a trench 5 feet long, 2½ feet wide, 6 inches deep at one end and 12 inches deep at the other. The trench is then filled with field stones, upon which the fire is built, and the excavated earth is banked about the sides. After the stones have become thoroughly heated, liquid wastes are poured into the trench at the shallow end. They come into contact with the hot stones at the bottom and are evaporated without destroying the fire. The solid wastes are placed on the fire where they soon dry out and burn as fuel.

If stones are not available tin cans may be substituted and used repeatedly. When neither stones nor cans are at hand a fire made in a trench of this character will destroy a considerable amount of garbage, both liquid and solid, but it is better to use stones or cans whenever possible.

Suppression of Flies.

In many camps flies are present in such numbers as to be a veritable scourge, and the screening of kitchens and mess rooms is frequently unsuccessful because of the overwhelming odds against it.

The favorite breeding places of common flies is in horse manure. Flies also breed in human filth, a fact which makes them especially dangerous to health of human beings. Even in camps where no horses are kept and where the excreta is properly disposed of flies may sometimes be found in large numbers. In such cases there may be neighboring stables and barns which furnish their quota of flies, or they may be found breeding in decaying vegetable or animal

material, in exposed garbage, in hogpens, poultry yards, or any other places which permit of the accumulation of filth.

Fly suppression in camps can be successfully accomplished only by doing away with their breeding places. Screens, fly traps, sticky fly paper, and poisons are all useful in waging war against flies, but are not in themselves sufficient. The fundamental rule to be enforced is that of absolute cleanliness of the camp and its surroundings. Human excreta, horse manure, garbage, and other wastes must be kept protected from flies.

As flies seldom travel more than 500 yards from their breeding places, the location of stables, hogpens, and chicken yards in their relation to the camp is of great importance, and they should be placed as far away as practicable. Hogpens, especially, must be placed a long distance off—one-quarter of a mile being advisable.

PERSONAL HYGIENE.

Diet.

In order that a diet shall be sustaining it must be properly balanced and contain a sufficient quantity of the constituents that have been found to be essential to life. These constituents consist of (1) nitrogenous substances; (2) starches and sugars; (3) oils and fats; (4) condiments; (5) water and salts; (6) accessory food substances.

The daily quantity of each required is expressed in calories or heat units. A man doing hard work needs from 3,500 to 5,000 calories a day. A pound of meat, a loaf of bread, and a quarter pound of fat contain about 3,500 calories. Some men can get along on less while others consume more, but this is the average amount eaten. Many persons overeat. The tongue becomes coated, there is a bitter taste in the mouth, the bowels are constipated, there is lassitude, drowsiness, and often severe headache. When overeating is persisted in for a long time it may produce obesity, gout, and degeneration of the walls of the blood vessels, leading to apoplexy, paralysis, heart and kidney disease. This is especially the case if large quantities of meat are consumed. The food should be varied from day to day. If this is not done, the diet becomes monotonous and distasteful.

The nitrogenous substances, such as meat, eggs, proteins of milk, the gluten of wheat and certain vegetables, are tissue builders or flesh formers. Oils and fats, both vegetable and animal, together with starchy food, such as bread, potatoes, rice, beets, etc., are force or heat producers. Meat should be cooked with heat sufficient to kill any animal parasites that it may contain. Cooking also softens the tissues which hold the muscle fibers together, it makes meat more tender, appetizing, digestible, and improves its flavor. Fruits are needed to furnish vegetable acids which are required to form carbonates necessary to preserve the alkalinity of the blood. Mineral salts are also essential. Rickets and bent bones in children are due to the absence of lime salts, and for this reason they should be given plenty of cereals, such as oatmeal and rolled oats, to prevent such conditions. Vegetables and fruits in the raw state should be thoroughly washed before being eaten, to remove any injurious germs which may be present. This should be done with the utmost care before eating radishes, lettuce, watercress, and celery, as dysentery, typhoid fever, and intestinal parasites have often been conveyed by them.

Pellagra is believed to be due to a diet which contains an insufficient amount of nitrogenous elements. The food of many persons in the South consists only of starches, sugars, and fats, such as corn bread, molasses, grits, rice, potatoes, fat hog meat, etc. Goldberger has produced pellagra among convicts by feeding them exclusively on such articles.

In this connection should be mentioned certain accessory food substances (vitamines, etc.), which are substances widely distributed in food products. If a one-sided diet is eaten, an insufficient amount of these elements is consumed and severe results follow. A diet of polished rice will produce beriberi, but a man living on rice with the outer coating left on will not develop the disease; moreover, if a man is sick with beriberi and he is given rice bran he will recover, if the disease has not progressed too far. There is a substance in the pericarp, or outer layer, of a grain of rice which prevents beriberi. When the rice is polished this substance is removed with the outer layer, and the lack of it causes the disease.

Milk.

Milk is a complete food in itself, as it contains nitrogenous elements in the form of albumen and casein, fat as cream, milk sugar, salts, and water. As it is usually consumed in the raw state and as it is an animal product, great care should be exercised to see that it is clean and free from disease germs. There are three classes of milk on the market: Certified milk, inspected milk, and market milk. Special precautions are taken to prevent the contamination of certified milk, which should not contain over 10,000 bacteria to the cubic centimeter. The dairies are subject to frequent inspection; the cows must be tested for tuberculosis and be examined by veterinarians at frequent intervals. The stables must be well ventilated and of

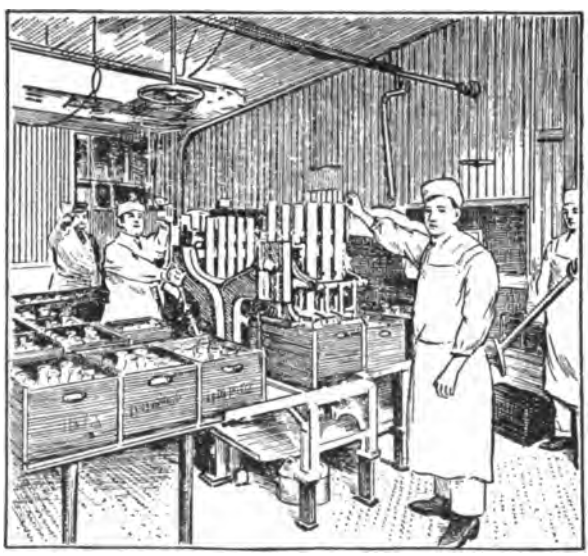


FIG. 74.—Milk bottles being filled and capped by machinery. The best method.

sanitary construction. The animals must be kept clean and be well cared for. The bag and udder should be washed before each milking. No manure should be allowed to remain around the building. The attendants must wear white clothing and must take frequent baths, and their hands and nails must be kept scrupulously clean. They must not be suffering from any communicable diseases or harbor the germs of such diseases. The milk must be carefully drawn from the cow so that no dirt will get into it. It should be immediately cooled thereafter, placed in sterile bottles, and kept at a temperature not above 50° F. until used. Inspected milk is milk obtained under the same precautions, except that the requirements for cleanliness are not quite so rigid. The number of bacteria per 1 cubic centimeter may be as high as 100,000.

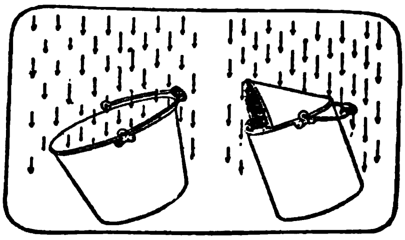


FIG. 76.—Two kinds of milk pails. The open pail admits the dirt; the covered pail keeps much of it out.

Market milk includes all other milk. It should be pasteurized before using. It is also safer to pasteurize inspected milk. The process of pasteurization is described on page 190.

If a family has a cow, everything about the stable should be kept as clean as possible. The walls should be whitewashed and no manure should be allowed to remain in the building, but should be placed outside in a covered barrel or manure box (see fig. 39) and removed from the premises at least once a week. The cow should be brushed

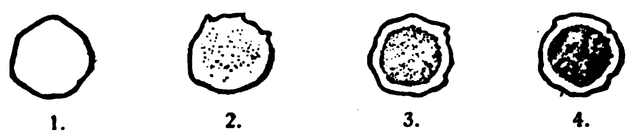


FIG. 77.—Four grades of milk as indicated by the dirt test. One pint of milk was poured through each of these disks of absorbent cotton, which were perfectly white at first. They show four grades of milk, as follows: 1, Perfectly clean; 2, slightly dirty; 3, dirty; 4, very dirty.

outside the building to remove all dust and dirt. A farmer will spend considerable time brushing his horse, but will never think of brushing his cow. The udder and teats should be thoroughly washed and dried with a clean cloth before milking. The milk pail should not be used as a container for the water needed for washing the cow. The milker should carefully wash his hands before beginning operations. No one with sores on his hands, or who is suffering from a communicable disease, or is caring for a person suffering from such a disease should milk a cow, as the germs of disease may be conveyed to the milk and infect other persons. Milk from animals with sores on their

teats should not be used, as severe sore throat may be caused thereby. The milk should be strained through a cloth and kept in a cool place free from dust. The milk pail should be scalded out with boiling water and drained without wiping.

Alcoholic Liquor.

Alcohol is a narcotic poison. Its action upon the human body is injurious and often leads to fatal results. The sale of liquors containing it should be as carefully restricted as that of morphine, cocaine, and other poisons, and it should not be permitted to be sold at nearly every street corner, as it is at present in many places. Alcohol is especially dangerous, as it seldom immediately kills, and to the casual observer appears to produce no permanent harm, but it should be remembered that persons who are addicted to the use of alcohol are more liable to contract diseases, as this poison lowers the vitality of the body and diminishes its power of resistance when attacked by the germs of disease.

The symptoms produced by alcohol are similar to those caused by the inhalation of ether or chloroform. There is a first stage of excitement, in which the person experiences a feeling of well-being; he is talkative and imagines that he is making a good impression upon those who are present. He loses his self-control, and his judgment and sense of propriety, duty, and responsibility are impaired. There is a lack of muscular coordination, as shown by the staggering gait, thick speech, and trembling hands. In the second stage there is delirium, general weakness, and depression, followed in the third stage by paralysis, profound sleep, insensibility, coma, and sometimes death. Any of these symptoms may be present, depending upon the amount of alcohol taken and the susceptibilty of the person to the action of the poison. The continued use of alcohol may produce chronic inflammation of the stomach, liver, kidneys, heart, and other organs of the body. The drooping lip, bleary eyes, reddened nose, dilated veins, and muscular tremor of the chronic drunkard are well known. The effect on the nervous system is startling, for besides causing disease of the lower centers, conducting fibers and nerves, the higher centers are severely injured, as is shown by the number of persons committed to asylums suffering from alcoholic insanity. It is estimated that one-fifth of the persons admitted to these institutions have been made insane by alcohol. In other cases, persons of weak mentality, who might otherwise live fairly useful lives, are pushed over the brink and rendered insane by alcohol, the temptation to indulge in which such persons are unable to resist, resulting in their becoming charges upon the State through their inability to support themselves.

Those who advise the use of liquors containing alcohol claim, first, that it is a stimulant. This is an erroneous idea, as although alcohol does at first slightly increase the blood pressure, there is soon a lowering of the same with symptoms of depression. Second, that it prevents one from catching cold. As a matter of fact, alcohol dilates the blood vessels under the skin, which results in a large amount of blood being brought to the surface, with a subsequent loss of heat and chilling of the body. Many cases of pneumonia are due to this cause. Arctic explorers and those exposed to severe cold find that the ingestion of alcohol is harmful and prefer hot tea or coffee. Third, that alcohol is a food. It is true that in persons accustomed to its use about an ounce of alcohol, which is the amount contained in a bottle of beer, may be used up in the body in a day. Any excess of this amount is excreted by the lungs or the kidneys. It is questionable whether the amount that is not excreted is itself a source of heat and energy, as the effects apparently due to it may be due to its action upon starches and foods. In any event its food value is small and not to be compared to other substances which are much better suited to the purpose. Fourth, that it is a medicine. It is seldom necessary to use alcohol for its medicinal effect. In such conditions as tuberculosis, heart disease, and shock, where it was formerly extensively employed, it is now considered to be harmful. It is true it has a certain value in the prostration of acute fevers, where food can not be administered, but even here other measures are preferable. In Guy's Hospital, London, the cost of alcohol administered to patients has been reduced from $7,660 to $734 per annum. In the United States Public Health Service during the fiscal year 1917 only 89½ gallons of alcoholic liquor were issued to the 20 marine hospitals, in which 11,325 patients were treated.

The use of light wines and beer, the former of which contains from 5 to 10 per cent and the latter from 2 to 8 per cent of alcohol, is less harmful than the distilled liquors, such as brandy, whisky, gin, rum, etc. The majority of the people of Germany drink beer and of Italy wine. It must be remembered, however, that the death rate of even moderate drinkers is much higher than that of abstainers. Some insurance companies estimate it to be nearly 20 per cent more. In order to increase the efficiency of the population during the present great war in Europe the English Government has had to greatly curtail the sale of alcoholic liquors, and in Russia their sale has been entirely prohibited. The following appeal was made by the Academy of Medicine in Paris to soldiers, warning them with regard to alcoholic beverages:

SOLDIERS, BEWARE OF ALCOHOL.

Those who, like you, are exposed to exhausting labor, to perilous enterprises, and to strong emotions, are ever inclined to look to alcohol as a stimulant and a comforter, and to seek for it in the tavern as a distraction from the monotony of cantonment and garrison life.

It is therefore well that you should know what use you may make of alcohol without impairing your health.

Certain errors about alcohol are widespread.

1. It is said to *give strength.* This is not exact. The truth is it gives a false spurt of short duration, but a grave diminution of strength never fails to follow this excitement. Thus alcohol takes away more strength than it gives.

2. It is also said that alcohol *gives warmth.* This is true for a few minutes, but the feeling of warmth which spreads over the limbs after a nip of brandy is delusive and is soon followed by a lessening of warmth and strength. Men who take nips are far more subject to chills and to diseases to which men at the front are liable.

3. It is further asserted that in the form of a "pick-me-up" alcohol stimulates the appetite. This is quite wrong. It would be difficult to produce any man whose appetite had ever been really stimulated by a "pick-me-up." These aperitifs, habitually taken, lead without fail to disease of the stomach, liver, and mind.

4. Lastly, it is maintained that alcohol *taken during meals* as wine, beer, or cider *aids digestion.* An important distinction must be drawn between "distilled" liquors like brandy and "fermented" liquors such as wine, cider, and beer. Alcohol is altogether noxious. The petit verre after meals should only be taken on rare occasions. Fermented liquors, on the other hand, may be drunk subject to two conditions: they must be consumed in great moderation, which, as regards wine, should never exceed 1 liter (1¾ pints) in 24 hours and *only at meals.*

Exercise.

In order to feel well it is necessary to take a certain amount of exercise, preferably in the open air. This is especially important if the person is a student, clerk, or engaged in some other sedentary occupation. The physical condition of the body is as important as the intellectual, for if the former breaks down the mental activities are greatly interfered with or rendered altogether impossible. Exercise should never be carried to the extent of fatigue or breathlessness. When these conditions arise a rest should be taken until they have entirely passed away. If exercise is persisted in under these circumstances serious injury may be done to the heart. In young persons the usual outdoor games and sports, such as tennis, baseball, swimming, and boating, are the best. Women and girls should take part in these recreations as well as men and boys. Setting-up exercises are especially beneficial for young persons, inasmuch as an all-round development is more nearly possible with this method than any other. These consist in alternately lowering and raising the body, moving it forward and backward and from side to side, and in swinging the arms and moving the legs in all possible directions.

A full description of them is given in books upon physical training. They are best taken as a drill by a number of people at the same time. Persons over 50 years old should not exercise violently. Their outdoor recreation should consist chiefly of riding, walking, and playing golf, where a sudden strenuous effort is not required.

Fatigue.

This condition is a sign that the body forces are strained and that if work is continued injury may result. This injury may not be apparent immediately, but will show itself in a weakened heart or nervous prostration later on. It results from two causes: The using up of organic force or energy, and the wear and tear of the organs which are overworked, so that matter and energy are consumed, while restitution does not keep pace with the work. It has been found that accidents are more liable to happen if employees are overworked, and that a person can not do efficient work if he is fatigued.

Hours of labor depend upon the character of the work, but where it is possible to do so the days should be divided into eight hours of work, eight hours of sleep, and eight hours of recreation, with one full day's rest once a week. In some cases, where the work is more than usually laborious or the nervous strain greater than ordinary, more hours of rest will be required. During the hours of recreation the mind should be free from the problems with which it is occupied during the hours of labor, so that the person may start in again fresh and invigorated.

Clothing.

Clothing worn in the house in winter should not be thick and heavy, as the body is then kept too warm, perspiration forms, and chilling occurs when going outdoors. It is much better to wear thinner clothing and put on thick wraps when going outside. In summer the clothing should be of a light color, as white absorbs the least heat. Woolen material is best in winter, as it is a poor conductor of heat. It also absorbs moisture and checks the evaporation of perspiration. Several thin, loosely-woven garments are warmer than a thick one. The advantage results from the layers of warm air inclosed between the meshes of the material. Undergarments, when made of wool, frequently irritate the skin, so merino, which is a mixture of wool and cotton, is generally used in its place for this purpose. Underclothes should be frequently washed, as it is necessary that they should be kept clean as possible. Woolen garments are liable to shrink unless the washing is carefully done. Such garments should be plunged one at a time in tepid soapsuds; they should be gently squeezed, but should not be subjected to hard rubbing. The soap should be rinsed out carefully with tepid water, after which

they should be hung up to dry without wringing. If there is a tendency to shrink they should be stretched into shape while drying.

Baths.

A bath should be taken at least once a day by everybody. The temperature of the water is of minor importance, except that a warm bath is more cleansing than a cold one. Old people, children, and weak persons should not take cold baths, as they are too depressing for such persons; nor should they be taken by anyone except in the morning and unless they are followed by a feeling of exhilaration. In order to bring about this condition after a bath the body should be rubbed briskly with a dry towel. A warm bath at night frequently induces sleep and is often beneficial to persons of a nervous temperament. In order to avoid catching cold, care should be taken not to sit in a draft after a warm bath. Shower baths are better than tub baths, as the water runs off the body and is not used again.

Care of the Mouth and Teeth.

It is important to take good care of the teeth. If they are allowed to decay, the food can not be masticated, indigestion results, and the body is not properly nourished. The bony processes of the jaws which hold the teeth in place are absorbed after the teeth fall out, allowing the cheeks to sink in, which makes the face look long and thin.

Dental decay is caused by fermentation of small particles of food which are permitted to remain in the crevices between the teeth. This fermentation is due to bacteria and results in the formation of acids which dissolve the lime salts of the teeth. The hard white outside coating of the teeth, known as the enamel, is first attacked. This is destroyed at spots where the food is lodged and the softer interior substance of the tooth is exposed; this is rapidly eaten away, and a cavity is formed which increases in size until only a hollow shell of enamel remains. The nerves of the teeth are extremely sensitive, and severe pain or toothache is produced when dental decay extends into a tooth. An abscess or gumboil may form at the root of a tooth. This causes a throbbing pain, swelling, and fever. It usually breaks through the gum, discharging pus, with relief of the symptoms; sometimes, however, the inflammation extends to the bone, ending in its necrosis or death. Occasionally pus organisms are absorbed into the blood and blood poisoning ensues.

An unclean mouth makes an ideal home for small organisms known as endameba buccalis, which many believe are the cause of pyorrhea dentalis or Rigg's disease. In this disease there is inflammation of the gums, which become soft, swollen, and bleed easily. The disease extends around the roots of the teeth, pus exudes from

their sockets, they are loosened, and ultimately fall out. The process may take a number of years, but more than half of the permanent teeth are lost in this way.

An unclean condition of the mouth renders the person more liable to catch cold, to attacks of influenza, bronchitis, and pneumonia. Headaches and neuralgic pains are often due to bad teeth. Many cases of so-called rheumatism result from the absorption of poison from the mouth and disappear when the disease conditions in the mouth are remedied. The same poisons often lead to sore throat, inflammation of the tonsils, disease of the eye and ear, and disordered digestion.

The teeth should be cleaned with a toothbrush at least twice a day, and care should be taken that all particles of food are removed. Wooden and metal toothpicks should not be used, as the gums are liable to be injured, which may be followed by inflammation and absorption of septic products. Quill toothpicks are less objectionable, but should be employed with care. When brushing the teeth, a small quantity of tooth powder should be placed upon the brush. The formula of one of the best tooth powders is as follows:

Magnesium peroxide	60 parts
Sodium perborate	30 parts
Powdered Castile soap and flavoring	10 parts

When a tooth powder is not available Castile soap can be used for cleansing the teeth.

Every person should visit a dentist at least twice a year to have his teeth examined, cleaned, and necessary repair work performed. A dentist should also be consulted whenever there is toothache or a gumboil. If it is impossible to obtain the services of one, temporary relief from toothache can be obtained by cleaning out the cavity and putting in two or three drops of oil of cloves on a small piece of cotton. For toothache without the presence of a decayed tooth to cause it, the application of heat to the seat of the pain will often give relief.

A gumboil should be opened by inserting a sharp-pointed knife along the side of the tooth down to the abscess cavity and cutting forward and outward. Before doing this operation the mouth should be rinsed out with a solution containing one part of hydrogen peroxide and three parts of water or some other antiseptic wash. The knife should be boiled before it is used, and the hands of the operator should be carefully cleansed with soap and water before performing the operation.

The treatment for Rigg's disease requires that the tartar and yellowish matter which has accumulated along the edges of the teeth and between the teeth be removed by a dentist, who should be consulted as to further treatment.

Care of the Feet.[1]

1. A good marching shoe should be large enough in all directions, but not too large. If the foot moves in the shoe it is liable to chafe and blister. A common defect in shoes is that they are too tight over the instep and too loose across the ball of the foot. If the leather forward of the instep is too slack, wrinkles will form. Folds of leather and rough inner seams should be avoided. The inner edge of the shoe should be almost straight, the sole thick and wide, projecting beyond the upper leather. The heel should be low and broad, and the toe of the shoe should be of such a length that there will be no pressure on the ends of the toes or toenails.

2. The toenails should be cut straight across, a little behind the end of the toe, and should not be rounded. Any tendency to ingrowing should receive treatment at once.

3. Corns and callosities are due to pressure and friction from unhygienic shoes. When between the toes they are soft; on other parts they are dry and hard. They often render men unfit for duty.

Treatment.—(*a*) Remove the cause by wearing hygienic shoes. Soak the feet well in hot water, thoroughly disinfecting them with bichloride (1 part bichloride of mercury to 2,000 parts water) or other disinfectant and then pare the corn or callus down with a sharp knife without wounding the skin. The hands of the person and the knife should be sterilized before the operation is performed. (See p. 184.) Fragments of glass and sandpaper should not be used on corns. Persons should be cautioned about the care and treatment of corns as a slight wound of the foot may lead to lockjaw or blood poisoning. Soft corns should be treated by applying a dusting powder like aristol on cotton or gauze between the toes.

(*b*) Apply the following collodian paint with a camel's-hair brush, night and morning, for several days, then soak the feet in hot water, and the corn will come away painlessly:

Acid salicylic	1 dram.
Extract cannabis indicæ	10 grains.
Collodii	1 ounce.

M. C. Corn paint.

4. *Blisters.*—Save the skin; drain at the lowest point with a clean needle. Protect with adhesive plaster.

5. *Excessive and foul perspiration.*—Excessive perspiration often leads to foot soreness, blisters, fissures, and corns, and may be offensive.

[1] From "The Landing Force and Small Arms Instructions" U. S. Navy.

(*a*) Mild cases will be relieved by dusting into the shoe and onto the foot the following "foot powder":

Acid salicylic	3 parts.
Pulverized amyli	10 parts.
Talci	87 parts.

This foot powder may be used with benefit before a march, especially in cases of sore or tender feet.

(*b*) Severe cases will be relieved by soaking the feet, after a preliminary scrub with soap and water, in a solution of permanganate of potassium. The stain should be left on the feet. The solution should be gradually increased from 1 per cent to 6 per cent and the treatment continued nightly for three weeks. The foot powder should be used during the day.

(*c*) Another method of treatment is to sprinkle a few drops of formalin into the shoe each morning.

6. The feet should be well greased with tallow or neat's-foot oil before a march, or the inside of the stockings should be covered with a stiff lather of common yellow soap well rubbed in, or the foot powder may be freely used.

7. Should the stockings cause pain, the pressure is sometimes relieved by shifting them to the other foot or by turning them inside out. Within two hours after reaching camp the feet should be wiped off with a wet cloth, clean stockings put on, and those which are removed washed for the following day, if possible.

8. Men unaccustomed to marching may toughen their feet by soaking them in strong, tepid, alum water (a teaspoonful to a pint).

CHILDBIRTH (LABOR).

Women usually go to a hospital or remain at home when they expect to give birth to a child, but occasionally labor begins without warning while the woman is traveling or otherwise unprepared. This is due in most cases to the period of gestation having been shorter than normal or miscalculation having been made by the woman or her physician as to the time labor should commence.

Normal labor is divided into three stages. The first stage extends from the beginning of labor pains until the mouth of the womb is completely dilated by the head of the child; the second extends from this point to the birth of the child; and the third from the birth of the child to the extrusion of the afterbirth. The length of the first stage is ordinarily about 12 hours, the second 1 hour, and the third 30 minutes. There is, however, great variation in this respect, and in some cases the child is born in a few minutes.

Symptoms.—During the first stage the woman is restless and apprehensive. At first the pains are not severe and occur not oftener than every 10 or 15 minutes. They are sharp, lancinating in character.

and feel very much like cramps in the abdomen due to indigestion. The pains gradually become more frequent, stronger, and longer in duration. They may last a full minute, during which time the woman will hold on to the bed, a chair, or anything that is within her reach. At the end of this period the sac inclosing the child bursts, and a portion of the water which it contains gushes forth.

During the second stage the pains are more powerful. The woman holds her breath, braces her feet, and uses all her muscles in an effort to expel the child from the womb. It is pushed through the pelvis, the soft parts at the end of the birth canal become stretched, and the head of the child is forced by an extra severe pain through the genital opening. The rest of the child is delivered after one or two more pains. This is followed by a discharge of blood and water, the former being from blood vessels which are ruptured when the afterbirth is separated from the walls of the womb, and the latter being the remainder of the water which surrounded the child in the womb. There is always some blood lost at every childbirth, so this hemorrhage need not cause alarm unless the woman's pulse becomes weak, her face pale, or she gasps for air. After the expulsion of the child the pains cease and the woman has an opportunity to rest. In half an hour or so the pains return and the afterbirth is expelled.

Care and treatment.—The woman should be made as comfortable as possible, but should not be required to lie down until after the bag of waters (the sac surrounding the child in the womb) has burst. Before this occurs she should pass her urine and an injection of warm water and soap should be given into the rectum to clear out all fecal matter. The lower part of the body should be washed with soap and water and then with a solution of bichloride, 1 part to 5,000 (one 7½-grain tablet of bichloride of mercury dissolved in 5 pints of water). Under no circumstances should water, oil, or any other liquid be injected into the birth canal, nor should anyone introduce a finger or other article into this canal to see "how the labor is getting along" or for any other reason. The bed should be covered with clean sheets. A piece of rubber sheeting or other waterproof article should be placed under the lower sheet to protect the mattress, and a number of other sheets or clean towels should be spread under the woman's hips to catch the discharge. The attendant who is caring for the woman should have on a clean white dress, and her hands and nails should be scrubbed with soap and water and then soaked in the bichloride solution (1 to 5,000). If she soils her hands in any way they should be again washed and disinfected in the bichloride solution. The woman in labor should not be held during a pain, but she should be allowed to hold on to any person or thing she grasps. When the genital outlet begins to bulge the nurse should place her disinfected hand on the tense tissues at the lower part of the outlet and gently but

firmly retard the downward movement of the head during a pain in order to prevent if possible the tearing of the tissue. As soon as the child is born it will usually cry, when it should be wrapped in a soft blanket and laid between the mother's legs. The nurse should now place her hand on the mother's abdomen and feel for the womb. This should be easily recognized as a hard, round ball. The mother should be carefully watched, and if no symptoms of faintness appear the nurse may turn her attention to the child for a few minutes. The natal cord should be tied with a strong thread in two places about an inch apart, the lower thread being placed about 1 inch from the child's abdomen. The thread used for this purpose should have been previously boiled. If there has been no opportunity to boil the thread it may be disinfected by placing it in the bichloride solution for 10 minutes, but boiling is the safest procedure. The cord should be cut between the two places where it has been tied, and the baby, after being wrapped in a blanket, placed in its basket. Do not put it in a chair, as it may fall off or some one may sit on it.

If the baby does not cry immediately after being born the nurse should introduce her finger into its mouth and remove any mucus which may be present. It should then be gently slapped on the hips or sprinkled with cold water. If it still does not cry the cord should be quickly tied and artificial respiration performed. The nurse seizes the child by the shoulders, holds it with the feet down and its back toward herself. She stands with her legs apart and at first allows the child to hang down between them, she then slowly carries the child over her head in such a manner that the legs fall toward its face so that the body becomes sharply flexed, after which she brings it back to its original position. This motion is repeated four or five times a minute. Efforts at resuscitation should be persevered in as long as the heart continues to beat. There are instances recorded where successful results have been obtained after trials lasting for 20 to 30 minutes.

If the woman shows any signs of faintness before the afterbirth comes away it is due to the loss of blood. This may be checked by causing the pains to begin again. The nurse should place her hand upon the mother's abdomen, grasp the womb and firmly but gently squeeze it to force out the afterbirth and blood clots. If this does not prove successful the nurse should sterilize her hand in the bichloride solution, introduce it into the birth canal, grasp the afterbirth and extract it.

The hand should not, however, be introduced into the birth canal if it is possible to avoid it as there is great danger of introducing germs which may subsequently cause blood poisoning and death of the mother. Never pull upon the cord as this expands the afterbirth and makes it difficult to remove. As soon as the afterbirth is grasped

it should be turned round and round so that the membranes attached to it may be twisted in a cord and thus brought out of the womb. If the mother shows no signs of faintness no effort should be made to squeeze the afterbirth from the womb for at least half an hour, as pains frequently return within that time and the afterbirth is expelled without assistance from the nurse. In either case the nurse should not forget to twist the membranes into a cord, for if they are not removed in this way infection of the womb may occur. The soiled sheets should now be removed from the bed and clean ones substituted, care being taken not to raise the mother's head, after which a binder should be placed on the mother's abdomen, using a stout pillowcase for this purpose held tightly in place with safety pins. A pad of clean towels should be placed under the mother to catch the discharge and she should be allowed to go to sleep. The birth canal should not be washed out with water or any other liquid after the child is born or during the mother's convalescence.

The baby should be rubbed with olive oil and given a warm bath. Its eyes should be washed with boric acid solution and a drop of a 1 per cent solution of nitrate of silver placed in each eye in accordance with the directions given on page 178. The stump of the cord should be well powdered with boracic acid covered with a pad of sterile absorbent cotton which should be held in place by small strips of adhesive plaster.

THE CARE OF THE BABY.[1]

I. Some Important Truths.

1. It is easier, better, and cheaper to prevent than to cure disease.
2. Everything that protects the mother before her baby is born improves the health of the baby after its birth.
3. Many of the diseases observed in older children and adults begin in infancy.
4. Healthy babies make strong men and women.
5. The baby's food, home, and surroundings play an important part in keeping it well or making it sick.
6. Mother's milk is the best food for babies.
7. Cow's milk which has become infected with disease germs kills many babies.
8. Extreme heat and impure air kills many babies in the summer, especially bottle-fed babies.
9. The health and happiness of the whole househould are improved by everything done to protect the baby.

---

[1] Prepared by a committee of the American Association for the Study and Prevention of Infant Mortality, except paragraphs on "Home Modification of Milk," "Constipation," "Colic," and "Condensed Milk."

II. General Suggestions for the Care and Feeding of Infants.

MOTHER'S MILK—NATURE'S FOOD.

1. The most loving act a mother can do is to nurse her baby. When the baby nurses, it not only gets the best food, but it is less liable to many diseases, such as "summer complaint," convulsions, and tuberculosis. Out of every 100 bottle-fed babies an average of 30 die in the first year, while of the breast-fed babies only about 7 out of every 100 die in the first year.

2. Nearly every mother can nurse her baby during the first 3 or 4 months of its life, and if she can nurse it for 10 months, so much the better.

3. There may be an abundant supply of milk after the first few weeks, even if there is but little at first; the act of suckling causes the milk to come into the breasts, and increases the supply. It is very important that the baby nurse regularly.

4. If the baby is too weak to nurse, a healthy infant can be used to excite the flow of milk until the baby has grown strong enough to nurse. This should not be done without a physician's advice.

5. The only way to tell how much food the baby is getting is to weigh it before and after each nursing; for at least 24 hours. The clothes need not be removed, but the baby should be dressed in exactly the same way when weighed after nursing as before. (If the baby should soil its diaper after the first weighing do not change it until after the second weighing.) In case the baby is not getting enough breast milk, the quantity lacking should be made up by properly prepared cow's milk. Let a physician decide this. This may be only a temporary shortage on the mother's part, and with suitable care the milk will probably increase so that the baby will eventually be satisfied with the breast only.

6. The following things influence the milk supply: Peace of mind is necessary for the mother; she must not worry; she should not get overtired. She should eat freely of her customary diet. The total quantity of fluids taken by her in 24 hours should not be less than 2 quarts; in hot weather more. Stuffing, however, is unnecessary and undesirable.

7. Consumption in the mother is practically the only disease that always forbids nursing. Paleness, nervousness, fatigue, pains in the back and chest, or the return of the monthly sickness are not sufficient reasons for weaning, but when these symptoms are present or pregnancy ensues a physician should be consulted at once.

8. Shortly after birth, boiled water, without sugar, may be given to the baby at regular intervals until the mother's milk supply is established. The baby, however, should be put to the breast at stated times, as often as the mother's condition permits.

IMPORTANT POINTS TO BE REMEMBERED IN NURSING THE BABY.

It is always wise to make nursing as easy as possible for the mother and to give her opportunities for rest. Therefore, the sooner the baby is satisfied and gaining on three-hour or even four-hour intervals the better.

Convenient hours for nursing the baby are as follows:

(1) Seven nursings in 24 hours: 6 a. m., 9 a. m., 12 noon, 3 p. m., 6 p. m., 9 or 10 p. m., and once during the night.

(2) Six nursings in 24 hours: 6 a. m., 9 a. m., 12 noon, 3 p. m., 6 p. m., and at the mother's bedtime; or at 6 a. m., 10 a. m., 2 p. m., 6 p. m., 10 p. m., and once during the night.

(3) Five nursings in 24 hours: 6 a. m., 10 a. m., 2 p. m., 6 p. m., 10 p. m., or later.

The baby should be offered cooled boiled water between feedings, especially during hot weather.

The length of time for nursing varies with the individual and the breast. The average infant rarely nurses longer than 15 minutes. The important point is to satisfy the baby. If there is any doubt, let it nurse longer, but not more than 20 minutes. If it is not satisfied after 20 minutes, consult a physician.

It is customary to nurse only one breast at each feeding, and to use them alternately. If, however, the baby does not get enough from one breast, give it both.

It is important to keep the nipples clean; they should be washed before each nursing. Caked breasts or cracked nipples are the usual causes of breast abscesses, and although they may be harmful to the mother, they do not make the milk poisonous for the baby. In both instances consult a physician. In order to avoid abscess, a caked breast should be gently rubbed with olive oil. Caked nipples should be washed before and after each nursing with boric-acid solution (one teaspoonful of boric acid to a glass of hot water).

III. Weaning.

The baby should be completely weaned at the end of the first year. Up to this time breast milk should be given to the baby as long as it thrives. It is better, when possible, to continue nursing through the summer and to wean in the fall. It is better to wean in the summer than in the spring, if by doing so the baby can have breast milk longer.

Do not wean the baby suddenly; it should be done gradually by replacing one breast feeding at a time with a bottle feeding. Several weeks are required for weaning.

It is dangerous to wean a young baby. It should not be done for the convenience of the mother and should never be done without the advice of a physician.

Contagious disease in the mother does not mean that it is necessary to wean the baby. In case of severe illness, contagious or otherwise, a temporary weaning may be necessary for the mother's sake. A physician should decide this. As soon as the mother's condition permits, the baby should be put back on the breast. The supply of breast milk can sometimes be brought back by putting the baby regularly to the breast for several days, even when nursing has been stopped for several weeks.

IV. Mixed Feeding.

When the mother's milk is diminishing it is advisable to make up the lack with properly prepared cow's milk. This may be done either by following one or more breast feedings with enough modified milk to satisfy the baby or by giving one or more full-bottle feedings in place of a like number of breast feedings.

The flow of breast milk tends to diminish when the baby nurses less than five times in 24 hours. When the baby is being nursed once every 4 hours and is not satisfied, it is better to give him after nursing enough modified milk to satisfy him, rather than to replace a nursing with the bottle. If, on the other hand, shorter intervals and more feedings are being used, a bottle feeding may take the place of a nursing without so much danger of decreasing the milk supply. Most babies need additional food after the seventh month.

V. Bottle Feeding.

Cow's milk is the most satisfactory substitute for mother's milk.

The best milk (this does not mean the richest milk) is none too good. Get "certified" milk if possible. If you can not obtain certified milk, get the cleanest and purest bottled milk you can find. Milk sold in bulk, or bottled from the can in stores, or by milkmen in their wagons, is likely to be stale and contaminated and not a proper food for the baby, even though it looks and tastes good. "Baby foods" and condensed milks and the like are not satisfactory substitutes for good cow's milk and often harm the baby.

Raw milk may carry the germs of tuberculosis, scarlet fever, tonsillitis, diphtheria, typhoid, and other communicable diseases. Unless the milk is above suspicion, danger should be prevented by proper pasteurization of the milk or by boiling or by sterilization.

Pasteurization.—Pasteurization means heating the milk to about 150° F. for 30 minutes and then rapidly cooling it. Milk for the baby should always be pasteurized in the feeding bottle. It may be done as follows: The milk should be mixed and poured into the clean feeding bottles, which should then be stopped with clean non-absorbent cotton. It is then ready for pasteurization. While a

number of satisfactory pasteurizers may be bought in the shops, a home-made pasteurizer can be easily constructed.

Take a wire basket that will hold all the nursing bottles for 24 hours and place this basket containing the bottles in a vessel of cold water filled to a point a little above the level of the milk. Heat the water and allow it to boil for five minutes. Then run cold water into the vessel until the milk is cooled to the temperature of the running water. The milk is then put into the ice chest, which should be not warmer than 50° F.

Sterilization.—By sterilization of milk is meant the process of rendering it germ free by boiling it on 3 successive days or by keeping it for 15 minutes under pressure at a temperature of 242° F.

Boiling.—Milk is boiled for one or two minutes in a large vessel and poured immediately into the sterilized bottles, stoppered with cotton,

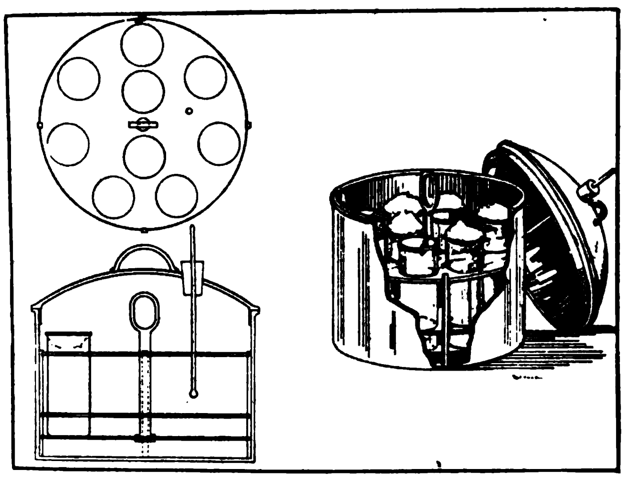


FIG. 78.—Pasteurizer for infant feeding bottles that can be made by any tinsmith.

rapidly cooled in running water, and put on the ice. This destroys all living bacteria, but not spores or eggs, which will not do harm unless the milk is kept too long after boiling. It should be used within 24 hours.

If the baby's milk is to be mixed with other ingredients, such as oatmeal, barley water, rice water, sugar, etc., these should be added to the milk before pasteurization, boiling, or sterilization. When the milk is once prepared the bottle should not be opened until it is given to the baby.

Home modification of milk.—A mother should nurse her baby whenever it is possible, but in case of her death or severe illness it becomes necessary to provide other food for the baby. Some mothers are unable to supply enough breast milk and the nursing has to be

supplemented by other nourishment. Cow's milk must be modified before it can be given to infants. The amount of fat is the same in woman's and cow's milk, but the latter contains more proteins and salts. Young babies can not digest the large amounts of proteins in cow's milk, so it must be diluted with water and cream and sugar added in order to make the mixture conform more closely to the composition of mother's milk. Limewater or milk of magnesia has also to be added to make the mixture slightly alkaline, as cow's milk is acid. Holt, in Sajous's Cyclopedia of Practical Medicine, gives the following rules for the preparation of food for healthy infants:

Whereas it is impossible to give simple rules by which every infant can be successfully fed, still experience shows that average healthy infants under 1 year old may be fed according to a schedule arranged for certain periods. The schedule applies to healthy infants of average weight, under average conditions, and is meant to serve as a general guide, not to be blindly followed, for varying circumstances will modify any plan of feeding.

Either whole milk or top milk may be used for making up the milk formulæ. If top milk is used, it should never be stronger than the upper half of the bottle, the top 16 ounces being removed by use of the ounce dipper. For healthy infants with a good digestion the use of milk mixtures made from top milk is advantageous and the amount of fat in such mixtures will seldom cause any indigestion. For infants with feeble digestions, however, or for those that have recently recovered from diarrhea, top-milk mixtures are not advisable; instead the formulæ should be made from whole milk or even from skimmed milk. In general, it may be said that during the first three or four months the top mixtures should be used. After the fourth or fifth month the food should be made up from whole milk.

As a general guide, it may be stated that during the first week of life the baby will need from 3 to 5 ounces of milk or top milk. This may be diluted with 8 ounces of water and 1 ounce of limewater, and to it should be added 1 to 2 even tablespoonfuls of milk sugar. The baby should take from 1 to 2 ounces of such a formula eight times in 24 hours.

At one month the baby will need about 10 ounces of milk or top milk. This may be diluted with 16 ounces of water or barley water and 2 ounces of limewater; 3 even tablespoonfuls of milk sugar should be added, and the baby may be offered from 3 to 4 ounces seven times in 24 hours.

At three months the baby will need about 16 ounces of milk or top milk, to which is added 14 ounces of cereal diluent, 2 ounces of limewater, and 4 even tablespoonfuls of milk sugar. The baby may take between 4 and 5 ounces six or seven times in 24 hours.

At 6 months the baby will need from 18 to 21 ounces of mixed milk, to which are added 18 ounces of a cereal diluent, 5 or 6 even tablespoonfuls of milk sugar, and 2 ounces of limewater. The baby may take between 6 and 7 ounces six times in the 24 hours. At 8 months the baby will take about the same quantity of food, but should have the intervals between the feedings changed to 4 hours, taking about 8 ounces at each feeding five times in the 24 hours. If the child is large and well developed and has a good digestion, a small amount of thoroughly cooked cereal, such as cream of wheat or farina, may be given at two of the feedings; and at 9 months part or the whole of a soft-cooked egg may be given at the midday feeding in addition to the bottle. The baby should be encouraged to chew on a crust of bread or zwieback in

order to learn how to swallow solid food. At 9 months the formula may be three-fourths milk and one-fourth of thick cereal gruel, and as the cereal given by itself is increased the amount used in the formula may be diminished, so that by 10 or 12 months the baby should be taking whole milk.

Cane sugar may be used instead of milk sugar, but only half the quantity should be employed.

Constipation.—If the baby is constipated, the milk should be diluted with oatmeal water instead of plain water. It is also well to increase the proportions of the other ingredients of the mixture. A baby's bowels should move every day, and if they have not done so a soap stick should be used before the baby is put to bed. This stick is made by whittling a small piece of white soap so that its end can be gently introduced into the baby's rectum, where it should be held for a few moments. This will usually result in the baby's immediately having a movement. Special care should be taken not to injure the baby's bowels. The soap stick should be coated with a little vaseline, and no force should be employed. A little sweetened orange juice will often overcome constipation.

Diarrhea.—When the baby has diarrhea, either with or without vomiting, stop all food at once. Give it 1 or 2 teaspoonfuls of castor oil, allow it to have plenty of boiled water to drink, and send, if possible, for a physician immediately. Save the soiled diapers for the physician to examine. (Always keep them covered.)

If the baby refuses to drink unsweetened, cooled, boiled water, give it barley or oatmeal water.

Be sure to wash the hands thoroughly after changing a diaper and before preparing food. Boil all the soiled diapers for half an hour to kill the dangerous germs which might spread the diarrhea among the other members of the household. Keep the diapers in a solution of strong disinfectant (2 tablespoonfuls of pure carbolic acid in 2 quarts of warm water) in a covered vessel until ready to boil.

Colic.—This is often due to too much fat or protein in the milk mixture, or giving the baby too large a quantity of food. It may be avoided by reducing the total quantity of food, or by using less milk and more water in the milk mixture. It may often be prevented by holding the baby over the shoulder after feeding and then to put it in a semireclining position on its side. Gas and swallowed air which is giving the baby discomfort is thus permitted to escape. Five or ten drops, according to age, of peppermint water in a little warm water may be of benefit. Paregoric in the same doses may be employed in severe cases, but the latter remedy should not be used frequently, as it causes constipation and masks other symptoms. An endeavor should be made to cure the condition by changing the composition of the milk mixture to suit the baby's digestion.

Condensed milk.—This milk contains too much sugar and is deficient in protein and fat. Its continued use makes a large, flabby baby and anemia, scurvy, or rickets are liable to develop. It may be necessary to employ condensed milk as a temporary measure when traveling or during very hot weather, if fresh milk can not be obtained. It should be diluted with water to 1 in 8 or 1 in 12. Cream should be added and it is well to give a little orange juice each day.

Oatmeal and barley water.—Add 2 teaspoonfuls of oatmeal or barley flour to a pint of boiling water. Boil for 20 minutes and then strain.

Preservation of the baby's milk.—After the baby's milk has been prepared it is very important that it should be kept cold until it is used.

A simple ice box can be made as follows: Procure a wooden box about 18 inches square and 12 inches deep. Get two tin boxes, one about 11 inches square and 9 inches deep, the other 10 inches square and 9 inches deep. Cracker boxes will do. Cut the bottom out of the larger box. Place 3 inches of sawdust in the wooden box. Put the larger bottomless box upon the layer of sawdust and fill the space between the wooden and the outer tin box with sawdust. Fasten the pieces forming the lid of the wooden box together with cleats nailed on the outer surface. Tack about 50 layers of newspapers, cut to the size of the wooden box, to the inner surface of the lid. Make hinges for the lid by tacking two strips of leather onto the outside of the box and then tack additional strips of leather to the front edge of the lid to catch on nails driven into that side of the box, in order to hold the lid down tightly. The ice box is now ready for use. Into the smaller tin box put your wire basket containing the filled and stoppered nursing bottles (or a quart and a pint bottle of milk) and surround them with cracked ice. Place the smaller tin box inside the larger and close the lid. Each morning remove the inner box, pour out the water, clean, and repack with ice. Keep the ice box in a cool, shady place. (Fig. 79.)

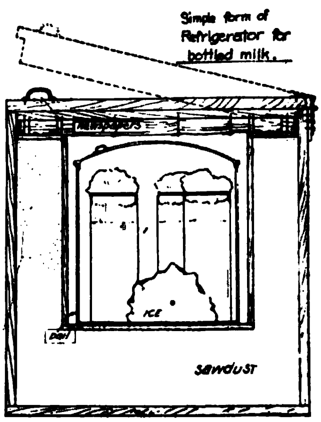


FIG. 79.

This ice box, if properly cared for, and kept full of ice, will keep a day's supply of milk cool and sweet.

PRECAUTIONS TO BE OBSERVED IN PREPARING THE BABY'S FOOD.

Everything that comes in contact with the baby's food must be clean. The hands should be washed with hot water, soap, nailbrush,

and dried with a clean towel before touching anything that goes into the baby's mouth. The dishes used in preparing the food should be boiled and allowed to dry from their own heat. Do not use a dish towel.

FIG. 80.—All utensils for the baby should be sterilized.

Bottles.—As soon as the baby has finished his feeding, throw out any remaining milk, rinse the nursing bottle and fill it with cold water. When ready to prepare the milk for the next 24 hours, empty the bottles, wash them thoroughly with hot soapsuds and a bottle brush, and then rinse and boil them for 15 minutes. The bottles are then ready for filling. (Fig. 80.)

Nipples.—Only nipples that can be kept clean easily should be used. They should be turned inside out, scrubbed, cleansed, and boiled. After boiling they should be kept covered in a clean, dry glass. Dirty nipples should not be kept with clean ones. Never use nipples connected with long glass or rubber tubes. (Fig. 81.)

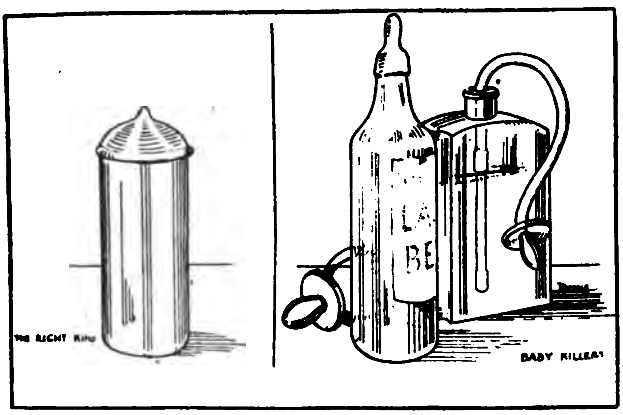


FIG. 81.—Proper and improper baby bottle.

DIRECTIONS FOR THE BOTTLE FEEDING OF BABIES.

Complete instructions for bottle feeding can not be given in a booklet like this. Babies that are artificially fed should be under the supervision of a physician, who should see them at regular intervals. Very young babies, or those that are not thriving, should always be seen once a week, while older healthy babies should be seen at least once a month, whether they are sick or well. The following rules and suggestions apply to all bottle-fed babies:

Before feeding warm the food to blood heat by putting the bottle in a vessel of warm water. Do not test the temperature of the milk

by putting the nipple in your own mouth, but sprinkle a few drops on the inner surface of your arm. Be careful not to allow the food to become too hot and see that it does not cool too much while the baby is nursing. This can be prevented by wrapping the bottle in a piece of flannel.

Hold the bottle for the baby throughout the feeding. Do not coax the baby to take more food than it wants, and do not allow it to drink longer than 20 minutes from the bottle. If it takes longer, there is something the matter with the baby or with the nipple.

If there is any food left in the bottle, throw it away; do not give it to the baby later.

Convenient feeding hours are the same as those for the breast-fed babies. (See p. 89.)

VI. The Home.

The welfare of the baby depends largely upon the condition of its home and surroundings.

Fresh air.—A satisfactory home for a baby should provide plenty of fresh air and sunshine. Much of the baby's time should be spent out of doors after it is 3 months old—on a porch or in the yard. A healthy baby should be kept out of doors at least four hours each day, even in winter, except when it is colder than 22° F. During the summer a newly born baby may be taken out of doors in the first week. During the winter months the baby should be gradually accustomed to the outside air. A good plan is to begin with an outing of 15 minutes at noon and gradually lengthen the time into the forenoon and afternoon, until the baby is out from 10 a. m. until 2 p. m. The baby must be properly clothed, according to the weather.

The surroundings of the home should be free from uncovered garbage, rubbish, and manure. All of these attract flies and other disease-carrying insects.

VII. The Baby's Room.

A quiet room, if possible with a south or southwesterly exposure, should be reserved for the baby. It should be well ventilated at all times. An open fireplace is desirable. The room should contain no upholstered furniture or heavy curtains. The walls and floors should be so finished as to allow frequent wiping with a damp cloth. A porch adjoining the baby's room and running water near by are desirable. The temperature of the baby's room should be kept not higher than 68° or 70° in winter and in summer should be kept as cool as possible with awnings and shutters. The windows should be kept open day and night in summer and in winter the room should be aired two or three times a day. The windows and doors should be screened

against flies and other disease-carrying insects. In the absence of screens, mosquito netting may be tacked on the outside of the windows. The cellar of the house should be dry.

VIII. Clothing.

Improper clothing may be harmful to babies in three ways: First, by being so tight that it prevents normal movements; second, by keeping the baby too warm; and, third, by not keeping it warm enough. The first fault can be avoided by making all of the baby clothes loose and roomy. Do not put on so many clothes that the baby perspires. All clothing except the shirt band and diaper may be removed in very hot weather. As the weather grows cooler, other clothing is added. The important thing for the mother to remember is that the baby is very sensitive to both heat and cold. She must be constantly on her guard to keep the baby cool enough in summer and warm enough in winter. The principal object of clothing is to insure a uniform body temperature. Loosely woven material should be used to allow proper ventilation for the skin. The use of a flannel bellyband is necessary until the cord drops off. After the first month it may be replaced by a knitted band with shoulder straps.

LIST OF CLOTHES FOR NEWLY BORN BABY.

Three flannel binders (½ yard of 27-inch flannel).
Three shirts, wool and silk or wool and cotton.
Two flannel petticoats.
Two flannel or knitted sacques.
Two pairs of worsted socks.
Two dozen diapers, 22 by 44 inches.
One dozen diapers, 25 by 50 inches.
Four white muslin slips.
One cloak.
One warm cap.
One pair of mittens.
One veil.
Two blankets.
One box talcum powder.
Two dozen safety pins, large and small.
Two bath towels.
Two soft towels.

LATER.

Three pairs of woolen stockings.
Three knitted bands with shoulder straps.
Additional diapers.

IX. Sleep.

Every baby needs 20 hours of sleep a day in its first month and not less than 16 up to the twelfth month of its first year. It should sleep alone, not in a cradle, but in a crib. If no crib is available, a clothes basket or a box of sufficient size is a good substitute. An expensive mattress is not necessary. A simple mattress made of excelsior and covered with a heavy blanket will answer very well. A sufficient quantity of clean bed clothing should be provided.

The room should be darkened and well ventilated; the windows should always be open at the top at least 6 inches, except in the

coldest weather. If the baby cries when it should be asleep, it is probably sick, overfed, or hungry.

All children should take a nap of from one to two hours in the middle of the day until they are 6 years old.

X. The Bath.

Every baby should be bathed at least once a day; during the hot weather two or three sponge baths may be given in 24 hours. The temperature of the bath should be from 90° to 95° F. in the early months. By the end of the first year the temperature may be lowered to 80° to 85° F. If you have no thermometer, a practical test for the correct temperature is to use water that feels warm to the elbow.

When bathing the baby in a tub let it rest upon your left arm, which is slipped under its back from the baby's right side. By grasping the baby under the armpit with the left hand a good hold is secured which prevents slipping. The right hand is left free for washing the baby. A special wash cloth, preferably of cheesecloth, should be provided for washing the baby's face and head.

After the baby is taken out of the tub it should be dried in a large soft bath towel.

Do not wash a healthy baby's mouth; it will do no good and may do harm. As soon as the baby has teeth, clean them carefully with a soft clean cloth or gauze, and later with a soft toothbrush and cooled, boiled water.

After the baby is dressed it is wise to keep it indoors for at least an hour after bathing and to protect it from drafts.

The best time for bathing the baby is just before its morning feeding, between 8 and 10 o'clock. After its bath the baby will be ready to take its food and go to sleep.

XI. Weighing the Baby.

The baby should be weighed regularly at least once a week for the first year and the record of the weight kept in a book. The most convenient time for weighing the baby is before the regular bath in the morning. It is well to remember that the record of the baby's gain in weight will be reliable only if it has been weighed at the same hour each time.

XII. The Normal Baby.

An average healthy baby weighs from 7 to 7½ pounds at birth, 15 pounds at 5 or 6 months, and 21 pounds at 12 months. In other words, the baby doubles its weight in 6 months and trebles it in 12 months.

It is 20 to 21 inches long at birth, 25 to 26 inches at 6 months, and 28 or 29 inches at 12 months.

More rapid gains are noted in the first 6 months than in the second 6 months. The average weekly gain is about 4 ounces.

It sleeps soundly.

Is happy, active, and enjoys using its arms and legs freely.

Begins to follow moving objects with its eyes at the second or third month.

Begins to sit unsupported at the seventh or eighth month.

Cuts its first tooth from the sixth to ninth month; has about 6 teeth at 12 months, 12 teeth at 18 months, 16 teeth at 24 months, and 20 teeth at 30 months.

Walks from the fourteenth to the seventeenth month.

The soft spot or opening in the skull closes between the eighteenth and twenty-fourth month.

Begins to say words like "papa" and "mamma" after the twelfth month, and simple, short sentences at the close of the second year. Children, however, that are otherwise perfectly normal may not begin to speak until a year later than the time stated above, or may present variations from any of the above.

XIII. Contagious Diseases.

The spread of most contagious diseases is caused through ignorance or carelessness. Inasmuch as contagious diseases often can not be distinguished from the noncontagious, it is wise to separate children from every sick person, young or old, until the true nature of the illness is known. If the disease is contagious, the separation must be kept up. This separation consists in placing the patient in a room by himself and giving him separate wash cloths, towels, and dishes. One person only should care for the patient, and the clothing of this person should be protected by a gown or long apron or sheet when in the patient's room. After caring for or handling the patient, the caretaker's hands should be carefully washed with warm water and soap.

Every person should cooperate to the fullest extent with the local department of health in its efforts to limit the spread of communicable diseases. Do yourself what you would desire of another parent whose child might be a source of danger to your own family.

So-called colds, such as running nose, sore throat, bronchitis, and the like are easily communicated to children and may be especially serious for the baby.

Do not sneeze or cough in the baby's face. A mother should protect the baby from catching her own cold by tying a handkerchief or piece of cheesecloth over her nose and mouth when nursing or caring for her baby. She should not kiss the baby.

Tuberculosis very often gets its start in infancy. Every effort. therefore, should be made to protect the baby from infection. Common ways of infecting the baby are by kissing it, coughing or sneezing near the child, or by allowing it to sit on the floor where it has a good chance to pick up tuberculosis germs with the dust on its toys or other objects and thus get them into its mouth. It is a good plan to have a separate room or at least part of a room fenced off as the baby's play room, and to cover the floor with a clean sheet each day. Milk from tuberculous cows may also be the cause of tuberculosis in the baby.

XIV. Eye Disease and Blindness.

Many babies within two or three days after birth, occasionally later, have what is commonly known as "sore eyes" or, as the mothers say, "have caught cold in their eyes." The proper name for this condition is ophthalmia, and it is caused by a germ getting into the eyes during the baby's birth. The eyelids become reddened and swollen and in a very few hours pus is seen in abundance. All such cases must be energetically and skillfuly treated at once by trained physicians. Neglect and carelessness may result in the loss of the baby's sight. The condition can usually be prevented if the physician puts a drop of a proper antiseptic in each eye immediately after the birth. (See p. 178.)

XV. Vaccination.

Do not forget that the earlier the child is vaccinated, the sooner it is protected against smallpox. In this country it is not possible to know when and where an outbreak of smallpox will take place. It is well, therefore, to be prepared.

The best time to have a baby vaccinated is in its first year. If the baby is healthy it may be vaccinated as early as the third or fourth month.

XVI. Birth Registration.

See that your doctor registers your baby's birth as soon as possible after it is born. Birth registration secures citizenship and may save future legal trouble.

XVII. Pre-Natal Care.

By this is meant the care and advice given to the mother before the birth of the baby in order that she may fit herself to bear and to care for it.

There is no doubt that the welfare of the baby depends largely upon the monther's health, and that many mothers would be better able to nurse their babies if they had proper care, food, clothing, and exercise before the babies were born.

In order to secure the proper advice as early as possible every prospective mother should consult a physician as soon as she knows she is to have a baby. If she can not afford the services of a physician, she should apply to a maternity hospital or dispensary where competent physicians and nurses are ready to advise and care for her until the baby is born.

If, for any reason, the prospective mother can not see a competent physician at least once a month during her pregnancy she should send a specimen of her urine to him regularly each month. She must drink enough liquid so that she will pass at least 3 pints of urine each 24 hours. Her bowels should move once a day. Persistent or sudden and severe headaches, swelling of the face or hands, increasing swelling of the ankles must be reported at once to the physician in charge. Any appearance of blood from the vagina demands instant summoning of the physician. As soon as a woman knows she is pregnant she should go to the dentist and have her teeth put in good condition.

The above statements are the merest outlines of the fundamental care which every woman should have. It must be remembered that if the prospective mothers are intelligently supervised and will report all untoward symptoms at once, deaths and disabilities of both mothers and children will be less frequent.

CARE OF THE SICK.

NURSING.

The sick room should have two windows so that it can be easily aired. A narrow, high bed is better than a broad, low one. The sheets should be put on without wrinkles and should be frequently changed. A rubber sheet should be placed under the lower sheet if there is danger of soiling the mattress. When it is desired to put a sheet under a patient, it should be rolled up to half its width, the roll tucked under the patient, the latter turned over on the unrolled portion, and the sheet spread out. A folded sheet called a drawsheet is often placed under the patient's hips. The nurse should wear clothes that can be laundered and she should keep herself scrupulously clean. It is well for her to have a pair of rubber gloves to put on when handling the bedpan or urinal. After performing duty of this sort she should immediately wash her hands and disinfect them with a bichloride solution 1 to 5,000 (one bichloride of mercury tablet, 7½ grains, dissolved in 5 pints of water). The patient should be given a sponge bath once a day for cleanliness, and his mouth should be frequently washed with a 4 per cent solution of boric acid (5 teaspoonfuls of boric acid dissolved in a pint of warm water). Cold baths are sometimes used to lower the patient's temperature. The bedclothes are thrown off and cloths wrung out of cold water are applied to his body, or he may be wrapped in a sheet wrung out of cold water. A fan may be employed to further cool the patient or ice may be rubbed over his skin. When the temperature has been reduced the bedclothes are again drawn over the patient. In some cases of kidney disease the hot pack is efficacious; a sheet is wrung out of hot water, the patient wrapped in it and the bedclothes immediately tucked around him. A hot foot bath is sometimes of service. A foot tub filled with hot water is put beside the bed, add a couple of tablespoonfuls of mustard previously stirred to a uniform cream in a cupful of hot water, place the patient's feet in the bath and keep them there about 20 minutes. The bath may be put in the bed if the patient is too sick to sit up. Hot-water bottles should never be more than half filled and should always be wrapped in a piece of flannel or blanket

and never allowed to come in contact with the patient's skin. Great care should be taken not to burn the patient, a thing which may easily happen if he is unconscious.

The nurse should see that the patient's bowels move daily, and that he passes his urine. If he goes over 24 hours without urinating, a catheter should be passed. The method of doing this is described on page 157. A history should be kept showing the temperature, pulse, and respiration taken at least three times a day, the number of bowel movements and times urine was voided, baths given, and nourishment administered.

The normal pulse rates is 72 to the minute, in a woman 80 a minute, in a child less than 1 year old from 105 to 120, 6 years old 90, over 10 years 80 per minute. Considerable variation from this standard may, however, be compatible with health. It should be taken by laying the fingers gently on a superficial artery, preferably at the point where the radial artery passes over the wrist. The normal temperature taken with a Fahrenheit thermometer is 98.6°, with a centigrade 37°. A temperature from 99° to 101° is called a slight fever, from 101° to 103° a moderate fever, 103° to 105° a high fever, 105° to 106° a very high, extremely dangerous, fever. In taking the temperature the following directions should be observed:

Place bulb of mercury in mouth under tongue for five minutes. If it registers over 101°, send for physician. Stay in bed until he arrives. See that it registers less than 97 before using. This may be brought about by shaking it. Grasp the thermometer at the middle between the index finger and the thumb of the right hand, hold the bulb downward and hit the lower edge of the right hand against the upper edge of the left hand; the column of mercury will be lowered by the shock.

The normal respirations occur at the rate of 18 to the minute. In disease there are marked variations in the frequency and character of the respirations. They should be taken without the patient's knowledge, as they are in a measure under the control of the will. This is done by laying the arm across the chest in taking the pulse, and then without removing the fingers from the wrist taking the respiration while appearing to take the pulse.

In all acute diseases, especially those attended with fever, the question of diet is a very important one, and the main reliance may be placed on such food as eggs and milk. Thin soups may be used, but they contain very little nutrition and can not be depended upon to maintain the strength of the sick.

A patient sick of a communicable disease should be isolated and some one detailed for his care and comfort, who, if practicable, should be immune to the disease.

Communication between the patient or his nurse and other persons should be reduced to a minimum.

Used clothing, body linen, and bedding of the patient and nurse should be immersed in boiling water or in a 3 per cent solution of carbolic acid before removal from room, and should be kept so immersed for 1 hour.

Eating and drinking utensils, after being used by the patient, should be washed in boiling water. They should not be used by others until they have been sterilized by boiling.

The room from which the patient was removed should be disinfected and thoroughly cleansed.

Formulas for disinfecting solutions recommended for use.

Bichloride of mercury[1] (1 to 1,000):		
Bichloride of mercury (two 7½-grain tablets)	grains	15
Water	quart	1
Carbolic acid[1] (3 per cent):		
Carbolic acid, pure	teaspoonfuls	3
Hot water	pint	1
Compound cresol (3 per cent):		
Liquor *Cresolis compositus*	teaspoonfuls	3
Water	pint	1
Bleaching powder:		
Bleaching powder (chloride of lime)	pound	1
Water	gallons	4

TYPHOID FEVER.

DOSES.—Unless otherwise stated, the doses mentioned in this book are intended for adults. To determine the dose for children, add 12 to the age of the child and divide the age of the child by this sum. This fraction will represent the size of dose compared with that of an adult. For example, a child 6 years old will require $\frac{6}{6+12}=\frac{6}{18}$ or one-third of the adult dose.

CAUTION.—Preparations containing opium, such as laudanum, paregoric, camphor and opium pills, Sun Cholera Mixture tablets, etc., should not be used except where absolutely necessary, as their continued use is liable to produce the drug habit.

Typhoid fever is caused by a germ known as the bacillus typhosus. This bacillus is found in the discharges of persons sick with the disease and sometimes for a considerable time after their recovery. When the food or drink of well persons becomes contaminated with these discharges, typhoid fever is apt to result. This contamination may be brought about by means of flies which convey small particles of fecal matter containing the bacillus of typhoid fever from privies to kitchens and dining rooms and soil the food by lighting upon it. Drinking water may become infected through the drainage of a cess-

[1] Poisonous solutions should be colored blue with a little laundry bluing in order to distinguish them from nonpoisonous solutions.

pool into a well or near-by stream. Milk may carry the disease through the washing of milk cans with such water. Persons caring for typhoid-fever cases may infect themselves or others if they are not careful. Finally, there are patients who have recovered from the disease but who still have typhoid bacilli in their stools. These individuals are called "carriers" and may cause sickness among many other persons. This is especially the case if they are employed in milking cows or in the preparation of food.

Symptoms.—Typhoid fever begins with headache, diarrhea, cramps in the abdomen, nosebleed, loss of appetite, coated tongue, dry mouth, and fever, which is higher each day than on the day previous. The stools are foul smelling and of the color and consistency of pea soup. In mild cases some of these symptoms may be absent. As a general thing the patient has been feeling badly for several days before the attack begins. At the end of the first week the patient is dull and apathetic, twitches his fingers, and picks at the bedclothes. There may be a low muttering delirium. The abdomen is distended with gas, and small rose-colored spots appear here and there on the body. Later on there may be hemorrhage due to ulceration of the bowel. Sometimes an ulcer will perforate the intestine and allow its contents to enter the general abdominal cavity; this usually causes death in a few hours. When hemorrhage or perforation occurs there is severe pain and the signs of shock are present. The pulse is weak and thready, the face is pale, the skin damp, and the temperature falls to normal. Typhoid fever lasts from 4 to 7 weeks. Convalescence is slow.

Abscesses and boils may form in various parts of the body, and bedsores are not uncommon. In persons who have used stimulants freely delirium tremens may be a prominent symptom. Pneumonia and meningitis are occasional complications.

Prevention.—Wells suspected of being infected with sewage should be closed until it is proved that contamination has not taken place. Water that is suspicious, if it is necessary to use, should first be boiled or treated with bleaching powder, 1 teaspoonful to every 500 gallons of water. The powder should be dry and only that taken from a freshly opened can should be used. During a typhoid epidemic milk should be pasteurized. This is done by heating the milk to 150° F. and keeping it at that temperature for half an hour. (See p. 90.)

No person caring for a typhoid-fever patient should prepare food for others. The nurse should wash her hands carefully after waiting upon the patient and before she eats her meals. After washing they should be immersed in a solution of bichloride of mercury (two 7-grain tablets of bichloride of mercury to the quart of water), or

a solution of bleaching powder, one-half teaspoonful to a quart of water, for a few minutes. The wearing of rubber gloves by those handling the patient is a good additional safeguard. Thorough scrubbing of the hands with soap and water only will do much toward removing the infection from the hands.

All water used for bathing the patient should be disinfected by adding 1 teaspoonful of bleaching powder to each gallon of water. The dishes and utensils used in caring for the patient should be immersed in bleaching-powder solution of the same strength as that employed for the hands. The urine and stools should be boiled or completely covered and thoroughly mixed with a bleaching-powder solution made by adding 1 pound of bleaching powder to 4 gallons of water. The mixture should be allowed to stand at least one-half hour before emptying into the water-closet. If there is no water-closet or sanitary privy about the residence, the discharges should be buried in the ground about 1 foot deep at a point remote from wells, springs, and other sources of water supply. The excreta, if deposited in the ground, should be thoroughly covered with earth to prevent chickens and other animals from having access to it. All towels, sheets, and other cloths used about the patient should be boiled or disinfected with bleaching-powder solution. Persons who have had typhoid fever should not be permitted to handle food until they have been proved free of typhoid germs by a microscopical examination.

Typhoid prophylaxis.—When typhoid fever is prevalent everyone should be inoculated with antityphoid vaccine to prevent taking the disease. This vaccine has practically eliminated this disease from the Army. During the fiscal year 1916 there were 220 cases of typhoid fever among seamen, of whom 31 died; if this vaccine had been administered to these men before they were taken sick, it is safe to say none of them would have had the fever. An attack of typhoid fever usually lasts two months, and the patient is as a rule too weak to do much work for another month, so that at least 75 days are lost by each attack of this disease. From the above calculation it will be seen that this would amount to 16,500 days' sickness for those that survived.

Treatment.—Place the patient in bed and do not let him get up. When he desires to have an action of the bowels, the bedpan should be used. He should have a liquid diet, plenty of water, milk, and thin soups, which should be given in liberal quantities, a cupful every two hours; no solid food should be allowed until 10 days after the fever has subsided. The temperature should be watched and the patient bathed with cold water whenever the fever rises above 39° C. (102.2° F.). Ice bags, if obtainable, applied to his abdomen and chest will assist in keeping the temperature down. One should also

be applied to the head if there is delirium. If there is distension of the abdomen hot turpentine stupes should be applied. This is done by wringing a double layer of thin flannel out of hot water with which a teaspoonful of turpentine has been mixed. An injection of a pint of warm water containing a teaspoonful of turpentine is also beneficial. The bowels should be kept open by injections of warm soapy water. In case of collapse give coffee or inject hot coffee or salt solution (one teaspoonful of salt to a pint of water) into the bowel.

TYPHUS FEVER.

Typhus fever, also known as hospital fever, spotted fever, jail fever, camp fever, Tabardillo, and ship fever, is a disease which causes great mortality when it becomes epidemic among persons infested with lice. The cause of the disease is not known, but it has been shown that the principal method of transmission is by the body louse.

Symptoms.—Incubation period is less than 12 days. The symptoms resemble those of typhoid fever but the onset is much more abrupt. It begins with a chill, headache, and pains in the back and legs; there is marked prostration so that the patient has to go to bed at once; there is high fever from the beginning, the tongue is furred and white, the face is flushed, and the bowels are constipated. Nervous symptoms are pronounced; the sick person may lie with his eyes open but be in an unconscious condition; he may pick at the bed clothes; there may be intense delirium, the patient trying to get out of bed. The eruption appears on the third to the fifth day; it consists of a number of dark red papules; there may be small hemorrhages under the skin. The rashes and the hemorrhages give the skin a curiously mottled appearance. The fever generally falls suddenly about the fourteenth day. In favorable cases it does not return, but preceding a fatal termination it may again rise very high.

Prevention.—It is necessary to be sure that all lice and their eggs on the patient's body and clothes are killed. It is better to remove the patient's clothing in an outer room. His body should then be annointed with a mixture composed of one-third gasoline and two-thirds vaseline. His hair should be soaked in a mixture of equal parts of vinegar and kerosene and his clothes wrapped in a sheet, after which they should either be destroyed or sterilized by boiling or steaming (see p. 58). The patient should then be put to bed in another room and the room in which he undressed should be scrubbed with a hot solution (3 per cent) of compound cresol solution (see p. 104). The body and clothing of persons who have lived with the sick man should be treated in the same manner. The doctors and nurses should take special precautions to prevent being bitten by

lice; they should wear rubber gloves and completely cover their bodies with gowns when going near the patient; a tight fitting cap should be worn so as to entirely cover the hair.

Treatment.—Patients are best treated in tents in the open air. There not only seems to be less liability of other persons becoming infected under these conditions, but it is much more beneficial to the patient. Sponge baths should be frequently given to keep the temperature as low as possible. An ice bag applied to the head is often of value. The bowels should be kept open by giving small doses of salts. The patient should be fed every two hours, being given a half glass of milk or a small bowl of soup. Water should be given freely and small pieces of ice allowed to dissolve in the mouth.

DYSENTERY.

Dysentery, or bloody flux, as it is sometimes called, is an affection —an inflammation and ulceration—of the mucous membrane of the large bowel. It occurs in different degrees of severity. It may be acute or chronic. There are different varieties. Its severest form is met with in tropical countries, where it frequently occurs in widespread epidemics. Epidemics also occur in temperate regions. Sporadic cases may be found almost everywhere. The disease prevails in summer and autumn.

Bad food, unripe fruit, impure drinking water, exposure to cold and dampness, while probably not in themselves the direct cause of dysentery, doubtless favor the operation of other causes.

Symptoms.—The onset may be sudden or gradual. There may or may not be chills or chilliness. There is usually some feverishness. The tongue is furred and moist, but soon becomes red and dry or brownish and glazed.

The first stools may be like those of an ordinary diarrhea. After a day or two, or maybe within a few hours, these are replaced with small mucous stools frequently mixed with blood and small particles of fecal matter. Soon the evacuations consist of mucus alone, or of blood and mucus, or of a jellylike matter and small white clumps of mucus. Later they may be shreddy, and brownish or greenish in color. The patient complains of cramps and "colicky" pains in his belly, a burning sensation in the rectum, with a feeling as if something must be expelled, and of a constant desire to go to stool. The evacuations may number from 10 to 20, or 40 to 50, or even 100 or more a day, according to the severity of the case. The quantity of each may not exceed a teaspoonful.

In mild cases there is a gradual change to normal, and patient may recover after a period of a week or 10 days. Severer cases continue for several weeks or longer and then recover or become chronic. Death may occur from general weakness.

Tropical dysentery, the variety which occurs most frequently and in epidemic form in tropical or subtropical regions, but also occasionally in temperate climates, is produced by a microorganism which enters the system in drinking water or food contaminated by the hands of those who have the disease.

The symptoms in this form of dysentery are similar to those already described. The burning sensation and bearing-down pain, however, are less marked. The stools are less frequent, but they are larger and more watery—at times more like diarrhea than typical dysentery. The disease in favorable cases runs a course of from 6 to 12 weeks. Recovery is always slow. Death may occur from exhaustion or from abscess of the liver, which is a common complication. In some epidemics the course of the disease is rapid.

Prevention.—In tropical climates or in places where the disease abounds water should be boiled before drinking, or it should be disinfected in accordance with the method described on page 25. As persons who have had the disease may still have the germ in their stools without showing any symptoms, care should be taken to examine all persons who handle food, as such persons may transmit the disease to other persons. The precautions described under typhoid fever should be taken by a person caring for a patient suffering from dysentery in order to prevent its spread.

Treatment.—Rest in bed. If possible, the patient should use the bedpan instead of the commode or closet, so as to insure the greatest amount of rest, which is important. Stop all solid food. Give 2 tablespoonfuls of castor oil and 15 drops of laudanum in one dose, and, if necessary, repeat the dose in six hours, or give smaller doses at intervals of four hours. After the bowels have been thoroughly cleared out, a pill of camphor and opium should be given every three hours. Hot applications should be placed on the abdomen. The bearing-down pain and the burning sensation may be relieved by washing out the rectum with a pint of warm water and by injecting 2 ounces of thin starch containing 25 or 30 drops of laudanum.

In place of the castor oil, Epsom salt may be given in tablespoonful doses, repeated every two hours until a free and large action of the bowels results, and then the pill of camphor and opium given every three hours. Or, instead of the camphor and opium pills, bismuth subnitrate may be given in 30 or 40 grain doses.

After two or three days, if the disease continues, the castor oil or the Epsom salt may be repeated, and after its effect is produced the same line of treatment continued.

The diet should be limited to the lightest articles, such as thin porridge, milk, and broths. And even in the lightest cases the patient should be kept warm in bed.

Tropical dysentery should be treated by injections into the bowel of large amounts of cold water (45° F.) containing 1 part of sulphate of quinine to 5,000 parts of water (3 grains of sulphate of quinine to 1 quart of water). Three-grain doses of emetine bismuth iodide given by the mouth every night before retiring for 12 nights is, however, the best treatment. When this drug can not be obtained salol-coated capsules of powdered ipecac may be used instead.

PNEUMONIA.

When a person suddenly has a severe chill followed by a high fever, flushed face, difficult breathing, and a pain in his chest, he may be suffering from pneumonia, and as this is a dangerous disease the services of a physician should be obtained at once.

Causes.—The disease is due to a germ known as the pneumococcus. It is a constant inhabitant of the throats of healthy people and apparently does no harm until the resistance of the body is lowered by disease, lack of food, drunkenness, or exhaustion due to severe physical exercise. Persons frequenting badly ventilated stores, factories, theaters, street cars, or other places where there are crowds are liable to contract pneumonia. Chilling of the body when overheated may bring on an attack. Many elderly persons suffering from chronic diseases die of pneumonia, the disease being often spoken of then as a terminal pneumonia.

Symptoms.—The sputum is abundant, tenacious, and of a reddish-brown color, whence the name "rusty sputum." The color is due to the admixture of small quantities of blood. The pulse at first is full and bounding, but later may become weak, rapid, and barely perceptible at the wrist. Breathing is embarrassed, the respiratory movements are rapid, 30 to 50 per minute, the patient is restless and often can not lie down but has to be propped up in bed or sit in a chair. There may be delirium, and if not watched the patient may jump out of a window and injure himself severely. The fever in a typical case remains high until the seventh or ninth day, when it will frequently drop to normal in a few hours. This is called the crisis, and if there are no complications it is followed by great improvement in the patient's condition and he generally goes on to recovery. In other cases the temperature does not return to normal, but only falls a degree or two for a short time and then rises again. This is called the false crisis and is of unfavorable import, especially if accompanied by profuse sweat and blueness of the skin.

Complications.—The disease is nearly always accompanied by pleurisy, which is an inflammation of the serous membrane covering the lung. This is the cause of the pain in the side. There also may

FIG. 82.—Pneumonia pneumococci, sputum preparation. *a*, Isolated cocci; *b*, in chain form.

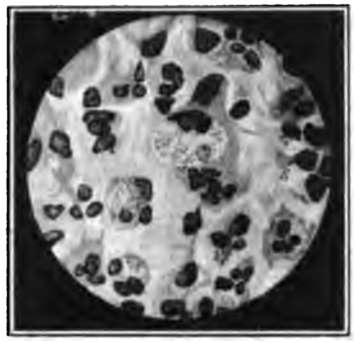


FIG. 83.—Influenza bacilli; sputum preparation.

FIG. 84.—Follicular type of diphtheria, child 7 years old, seen on second day of illness. The membrane involved the lacunæ of tonsils. Note close resemblance to follicular tonsilitis.

FIG. 85.—Septic type of diphtheria, child 8 years old, seen on the fifth day of illness. The pseudomembrane in this case covered the hard palate and extended in a large mass down the pharynx, completely hiding the tonsils.

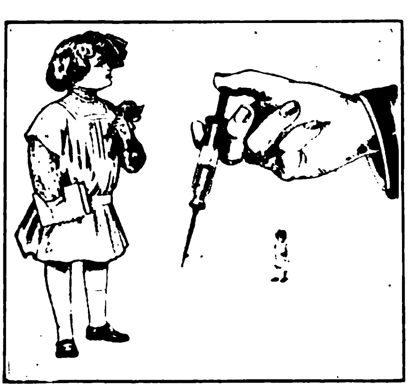


FIG. 86.—Antitoxin has reduced the diphtheria mortality from about 45 per cent to less than 10 per cent.

FIG. 87.—Smallpox. Tenth day of eruption. (By Welch and Schamberg.)

FIG. 88.—Well-pronounced, discrete smallpox in an unvaccinated subject on the eighth day of eruption, showing the relative sparsity of lesions on the trunk.

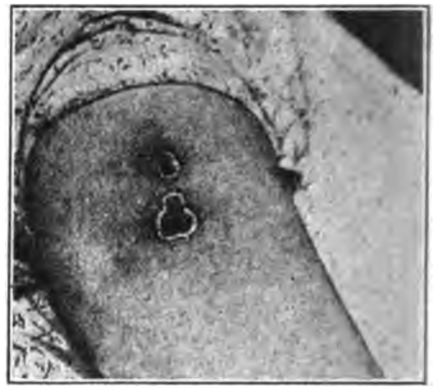


FIG. 89.—Revaccination in an adult, showing the vesicles upon the eighth day. (By Welch and Schamberg.)

FIG. 90.—Smallpox. Mother and daughter. The daughter, through vaccination, although exposed, did not contract the disease.

FIG. 92.—A severe attack of chicken pox, showing lesions in various stages of development (fourth day). Relative sparsity of lesions on the face as compared with the trunk. (By Welch and Schamberg.)

be inflammation of the membranes covering the heart, brain, or spinal cord, causing special symptoms due to injury of these structures.

Prevention.—Do not expose yourself to a draft when overheated. When chilled do not drink whisky or other alcoholic beverage, as the liability to contract pneumonia is increased by alcohol, for although it gives a feeling of well-being, the temperature of the body is lowered and the power to resist disease is diminished by its use. A cup of hot tea or coffee, on the other hand, is beneficial and helps to restore the body to its normal condition. It should be remembered that pneumonia is a communicable disease, and that it may attack nurses and those who are waiting upon the patient. This is especially liable to happen if the room is poorly ventilated. The nurse should wear a gauze mask and be careful that the patient does not breathe in her face. Her hands should be disinfected with a solution of bichloride of mercury, 1 to 2,000 (one 7½ grain tablet of bichloride of mercury to 1 quart of water), or other disinfectant, after waiting upon the patient. All dishes, utensils, towels, sheets, and other articles used by the patient should be boiled or disinfected with a solution of bleaching powder (one-half tablespoonful of bleaching powder to a quart of water). Compound cresol solution should be used to disinfect the sputum.

Treatment.—The essential thing in the treatment of pneumonia is to see that the patient gets plenty of cold fresh air. Oftentimes no other treatment is necessary. The bed should be placed upon a porch, or, if this is impossible, all the windows of the sick room should be wide open. The patient should be well covered, and hot-water bottles or hot bricks should be placed near his feet to keep them warm, care being taken not to burn him. Once a day the patient should be moved to a warm room and given a sponge bath. The pain in the side can be relieved by a mustard plaster (p. 310) or by the administration of one-fourth of a grain of morphine sulphate. Two grains of calomel and four grains of sodium bicarbonate, followed in about 6 hours by a Seidlitz powder, should be given on the first day, and the bowels should be kept open thereafter by a small dose of salts given each day. The patient's strength should be conserved by giving him a glass of milk or a bowl of soup every two hours during the day, and also at night when he is not sleeping. Solid food should not be given, as it will cause gas in the stomach, which may press against the heart and seriously interfere with its action. Milk is the best food, but sometimes it produces gas, in which case soups alone should be used.

76912°—19——9

INFLUENZA.

This disease begins like a cold. There are pains in the head, eyes, and limbs; a watery discharge from the nose, chilly sensations, sore throat, cough, and extreme muscular prostration. The sputum is of a dirty yellowish color. There may be abdominal symptoms such as nausea, diarrhea, vomiting, and cramps. There is fever, which varies according to the intensity of the disease. There are many varieties of the disease, and any organ of the body may be attacked. Pneumonia is a frequent complication.

Prevention.—Care should be taken that no one suffering from the disease coughs in your face. Keep away as much as possible from such persons. A cold in the head or on the chest may be due to the influenza bacillus, so do not sleep with persons suffering from these conditions. Wear a mask made of several layers of gauze when nursing a person suffering from this disease.

Treatment.—Aspirin, 5 grains every three hours, often relieves the pains. A mild purgative, such as a Seidlitz powder, should be given. The tendency to diarrhea should be remembered, so strong purgatives such as salts should not be administered. When there is pain in the abdomen a camphor and opium pill is of value. A light diet such as milk and soups should be taken. Steaming the nose and throat by inhaling steam from a teapot filled with hot water into which a small lump of camphor has been dropped will relieve to some extent the congestion of those structures.

ERYSIPELAS (ST. ANTHONY'S FIRE).

Erysipelas is an inflammation of the skin. It usually begins with a chill, followed by a high fever. It is a complication of wounds, but is more frequently developed without any apparent injury. A large majority of cases begin on the face, usually on the nose, first as a small red spot, which is soon elevated above the surrounding skin, and gradually or rapidly spreads over the face and ears, and not infrequently over the entire hairy scalp; sometimes over the neck and chest, and occasionally down the back, and to other parts of the body. The skin is red, hot, painful, and swollen, and blisters frequently form. The swelling may be most marked about the eyes and ears, the eyes closed, and the patient's features changed and distorted to such a degree that the appearance once seen will not soon be forgotten. The disease, if limited to the face and scalp, usually runs its course in a few days or a week, but sometimes before the face is healed red spots appear on other parts of the body, and the case may be prolonged. Abscesses beneath the skin are not uncommon.

Besides the symptoms already mentioned there are headache, loss of appetite, coated tongue, frequently vomiting, and in some cases delirium and marked depression.

The outcome is usually favorable, but in drunkards or in persons debilitated from previous diseases death is sometimes the result.

Prevention.—Erysipelas is only slightly contagious under ordinary circumstances, but persons suffering from wounds or scratches of the skin are very apt to be attacked. The patient should, therefore, be isolated—placed in a room by himself—and his attendant should be a healthy person free from any skin injury. Wounds should be carefully dressed with antiseptic solutions to prevent the development of erysipelas.

Treatment.—The disease is self-limited, recovery usually taking place in from 12 to 14 days. The bowels should be kept open and the strength supported by feeding the patient frequently—every two or three hours. The diet should be light and consist of milk, broths, puddings, etc. If the temperature rises above 103° F., the patient should be given a cold bath. The eyes should be frequently washed with a 4 per cent solution of boracic acid (boracic acid 4 parts, hot water 100 parts). Cloths wet with boracic acid may be also placed upon the skin or an ointment of 10 parts of boracic acid and 90 parts vaseline spread upon a clean cloth may be used in its stead. Blisters that form should be pricked with a needle and the water allowed to drain off, but the skin should not be disturbed.

DIPHTHERIA.

Diphtheria is a communicable disease, due to the action of the bacillus diphtheriæ. When conditions are favorable this germ causes an inflammation of the lining membrane of the throat, upon which a grayish fibrinous exudate forms. The constitutional symptoms of the disease are the result of the absorption into the circulation of toxins or poisons produced at the site of the lesion. The grayish exudate is usually on the tonsils and palate, but it may extend up into the nose or down into the windpipe. A raw bleeding surface is left when a portion of this exudate or false membrane is detached. Efforts at swallowing cause strangulation or choking, and the patient may become asphyxiated by the exudate membrane blocking up the larynx. The voice is often husky, and there may be a rough cough, to which the term "croupy" has been applied. In severe cases there are high fever and great prostration.

Sequelæ.—Paralysis may follow diphtheria. This may be slight, only affecting the palate, giving the voice a nasal character, or severe, nearly all the muscles of the body being involved. Weakness of the heart sometimes causes death as late as the sixth or seventh week.

Nephritis may be one of the complications of the disease, but dropsy is less common than after scarlet fever.

Diagnosis.—Whenever a grayish exudate is seen on the throat diphtheria should be suspected, especially if much inflammation is present and if bleeding occurs when a piece of the false membrane is detached. Diphtheria examination packages are now supplied free by most drug stores. These packages hold two glass tubes, one of which contains blood serum and the other a sterile swab. The tubes are closed by cotton plugs. These should be removed, the swab wiped over the throat, and then gently rubbed over the blood serum. The swab should then be replaced into its own tube, the cotton plugs of both tubes replaced, and the tubes mailed to the health officer of the city or district. A postal card will be mailed by him the next day to the sender stating whether or not the person from whom the specimen was taken has diphtheria.

Prevention.—School teachers should watch the children under their care; and if one complains of sore throat or has a croupy cough, the school physician should be requested to make an examination of the child to determine if these symptoms are due to diphtheria. All persons suffering from this disease should be quarantined, and those who have been exposed to it and respond to the Schick test should be given a small dose of diphtheria antitoxin (1,000 units) as a preventive measure. The Schick test, which can be made by any physician, shows if the child has a natural immunity against the disease. No protective dose need be administered to a child having this immunity. When diphtheria is prevalent school children should be examined to ascertain if there are diphtheria germs in their throats, as these germs may be present without causing the disease. Such persons, known as diphtheria carriers, may, however, communicate the disease to other persons, and therefore should be excluded from the schools.

Treatment.—As soon as it is suspected that a person has diphtheria a physician should be sent for, if possible, as it is important that diphtheria antitoxin should be administered to the patient at once. If this serum is given in sufficient quantities (5,000 to 10,000 units) early in the disease, the symptoms disappear like magic. The fever subsides, the inflammation in the throat abates, the exudate is cast off, and the tissues heal promptly. The dose of antitoxin should be repeated in a few hours if the fever continues. Some cases, where the disease has remained untreated for several days, require large quantities of antitoxin (80,000 to 90,000 units). Where antitoxin can not be obtained the patient should be given stimulants, cold compresses should be applied to the neck, and the throat should be frequently swabbed with the following solution: Carbolic acid, 3

parts; water, sufficient to make 100 parts. Calomel, one-fourth grain every two hours, is recommended by some physicians, but the patient is liable to become salivated. The room should be warm, a window partly open for ventilation, and the air kept moist by making a hood with a sheet placed over a frame on the bed and allowing the steam from a kettle to pass under it. A liquid diet should be given, and if it impossible for the patient to swallow he should be fed by the rectum. If there is obstruction of the larynx and the patient is blue in the face, intubation or tracheotomy has to be performed. In the first operation a special hollow tube with a thread attached is inserted in the larynx, being guided in place by the finger. If no intubation tube is available, recourse should be had to tracheotomy. The physician grasps the windpipe between the forefinger and thumb of the left hand, pushes the other tissues of the neck to each side, and opens the windpipe in the middle line. All bleeding should be stopped by artery forceps or ligatures before windpipe is opened. This operation requires some skill and should not be performed except as a last resort. The patient should not be allowed to mingle with other persons until a culture has been taken, as described under "Diagnosis," and sent to the city or State department of health and found to be negative—that is, no germs of diphtheria present. The room and its contents should then be disinfected, as described under the heading "Measles."

RHEUMATISM.

There are different forms of rheumatism, and some of the forms have several different names. Acute rheumatism, acute articular rheumatism, inflammatory rheumatism, and rheumatic fever are terms applied to one and the same disease. A milder form of the affection is called subacute rheumatism. In this form the symptoms are less severe, but the disease is more prolonged. It may continue for a long time and become chronic. Chronic rheumatism, however, or the different affections and deformities of joints to which this term is frequently applied, may develop independently of any acute or subacute attack.

The term muscular rheumatism indicates an affection of the muscles as distinguished from joint affections. Lumbago and stiff neck are varieties of muscular rheumatism. The muscles, however, to a greater or less extent, may be involved in any form of rheumatism.

Other conditions simulating rheumatism, occurring in connection with or directly due to gonorrhea or to syphilis, are called gonorrheal rheumatism or syphilitic rheumatism, as the case may be.

Rheumatism, either the acute or the chronic form, may be due to the absorption of germs, or poisons produced by them, from abscesses

at the roots of the teeth, or infections in the tonsils, nasal passages, or other parts of the body.

Prevention.—The early removal of adenoids and diseased tonsillar tissue may prevent not only attacks of rheumatism, but inflammation of the valves of the heart, leading to impairment of that organ in after life. The child's teeth should be carefully examined by a dentist, X-ray plates being taken if necessary to discover if there are any abscesses around the roots. Such abscesses should be drained to prevent the absorption of poisons which may be the cause of the rheumatism.

Acute Rheumatism (Rheumatic Fever).

This is a comparatively common disease in all climates within the Temperate Zone. It occurs chiefly during the winter and spring. Exposure to a cold, damp atmosphere is the most frequent exciting cause in persons predisposed to the disease.

It may or may not begin with a chill or with a sore throat. The larger joints are usually affected. Swelling, heat, redness, tenderness, and pain are the chief symptoms. The inflammation is apt to shift from one joint to another. The pain and fever are usually increased in proportion to the number of joints involved. The majority of cases are attended with profuse perspirations, scanty, highly acid urine, coated tongue, and constipation. The heart is frequently involved.

In treating, wrap the joint in cotton or flannel; keep it very quiet—the slightest movement aggravates the pain. Flannel wrung out of hot water and applied to the joint sometimes affords relief. A liniment composed of 10 to 50 per cent of oil of wintergreen in olive oil may be applied on a piece of flannel if the pain is severe, or cold applications may be employed if agreeable to the patient.

Place the patient in a good bed, and let him wear flannel next to his skin. Change the flannel frequently, and bathe the body with tepid water.

For internal medication give salicylate of soda or aspirin in doses of 10 grains every two hours until about eight doses are taken or the pain is relieved; then give it in smaller doses of from 3 to 5 grains every six hours.

The food should be soft and nourishing and given every three hours. Epsom salt should be given to keep the bowels open. The patient should be kept in bed for a few days after the symptoms have subsided. The duration of the disease is very uncertain. The acute symptoms may subside in a few days and the patient may be up and about in a week or 10 days, but relapses are common, and the acute may pass into the subacute or chronic form.

Chronic Rheumatism.

In chronic rheumatism there is stiffness and pain. A cracking or grating sound is frequently produced when the joints are suddenly moved. In severe cases the joints become enlarged and distorted. The deformity is sometimes very great.

The treatment consists chiefly in local application of liniments, etc., which afford relief because of the rubbing (massage) by which they are applied. Severe pain in the joint may be relieved by cold applications (flannel wrung out of iced water, applied to the joint and covered with muslin). Hot applications to the joints are sometimes of value. Belladonna plaster may be applied.

Five to eight grains of iodide of potash in a glass of water may be given three times a day between meals.

The general health should be looked after. The skin should be kept in good condition by frequent baths of tepid water. The bowels should be moved at least once a day. Patient should be allowed good food. Fresh air is also important.

Muscular Rheumatism.

In this disease the muscles most frequently affected are those of the back (lumbago), side of neck (stiff neck or wry neck), and side of chest (pleurodynia). Exposure to cold, sudden cooling of the body—especially after active exercise and sitting in a draft of air—are the chief causes or exciting causes.

As a rule there are no symptoms other than the stiffness and pain on motion. The muscles may be slightly swollen and very sensitive. Some times the attacks come on suddenly and apparently without cause, or following a slight twist or strain, as a "kink in the back," or patient may wake up in the morning with a stiff neck.

In treating acute cases salicylate of soda or aspirin may be given in 5 or 10 grain doses every three hours until four or six doses are taken. Apply hot applications, dry heat, hot-water bag, or a hot poultice locally, or the heat may be applied by a flatiron over folds of flannel or a piece of blanket and the rheumatism "ironed out." Later apply liniment with friction (massage). Keep the affected muscles at rest. If the muscles of the chest are affected, apply strips of adhesive plaster, the same as for fractured rib. Acute attacks are of short duration, but relapses are not uncommon, and chronic forms are frequently met with. Good food, fresh air, and attention to the general health are especially important in the treatment of chronic muscular rheumatism.

Gonorrheal Rheumatism (Gonorrheal Inflammation of Joints).

This may occur during an acute attack of gonorrhea, but it is more frequently associated with chronic gonorrhea or gleet. One or several joints may be affected. There may or may not be considerable fever. If only one joint is affected, it is apt to be the knee or the ankle. In chronic cases the pain is sometimes centered in the heel. The attack may begin in the wrist, elbow, or shoulder. The disease is not always limited to the joints. Sometimes the inflammation is in the tissues outside the joint proper, in the sheaths of the tendons of muscles, or in the fascia of the soles of the feet. The swelling is frequently quite marked. In chronic cases there may be effusion ("water on the joint"). In very severe cases suppuration occurs (abscess forms). The eye and the heart may also be seriously involved.

Treatment is not very satisfactory. Keep the joint at rest. Apply a flannel bandage. Change it frequently and wash the joint with hot water and soap. In chronic cases liniments and passive motion should be applied. Tincture of iodine may be painted over the joint. A few drops of oil of wintergreen rubbed gently on the joint before the application of a bandage will often allay the pain. Aspirin, 10 grains every 3 hours, may be given if the pain is severe.

Syphilitic Rheumatism.

This so-called rheumatism is associated with secondary or tertiary syphilis. The joints and the shafts of long bones may be affected—thickened and painful. The pain is always worse at night.

The treatment is by iodide of potash, beginning with 10 grains of iodide of potash three times a day between meals. Good food should be given and the bowels kept open. (See p. 152.)

SMALLPOX.

Smallpox is an acute, contagious disease, characterized by an initial fever and successive stages of eruption. It spreads rapidly among persons unprotected by vaccination. It may be communicated by the breath, by exhalations from the skin, by clothing, or by anything that has been in contact with a person suffering from the disease.

After a period of incubation of from 8 to 14 days, occasionally longer, the disease begins suddenly, usually with a chill, always with severe pain in the back and loins, intense headache, and high fever. Vomiting occurs in many cases. The bowels may or may not be constipated. About the end of the third day or on the fourth day a papular eruption appears on the forehead, and frequently on the lips and the wrists, occasionally in the mouth and throat, and gradually ex-

tends to other parts of the body. The eruption begins as a bright red dot or spot slightly elevated above the surrounding skin, enlarging until the second day, when it forms a papule. The papule is hard to the touch, feels like shot under the skin. As soon as the eruption appears the temperature begins to fall, and the distressing symptoms subside. On the fifth or sixth day a small vesicle, with a depression of the center, appears on the top of the papule. The vesicles gradually become distended, the depressed center rounded out, and about the eighth or ninth day the change is completed and the vesicles become pustules. They have a yellowish gray appearance and each pustule is surrounded by a red border. The skin between them is swollen, the eyes may be closed. During this change the temperature rises again, secondary fever sets in, the chief symptoms return, and a day or two later another change begins. The pustules break, matter oozes out, crusts form, first on the face and then over other parts of the body, following the order of the appearance of the eruption. The secondary fever may be quite high in the beginning, but gradually declines as the pustules change into crusts, and in favorable cases seldom lasts more than two or three days. The crusts then rapidly dry and fall off, leaving red spots on the skin and here and there the characteristic pockmarks or pits. The healing of the pustules is usually attended by troublesome itching.

In some cases a diffuse redness of the skin or red spots appear on the abdomen, or on the side of the chest, or on the inner surface of the thighs as early as the second day, but the distinctive papular eruption makes its appearance, as stated, at the end of the third or on the fourth day and nearly always begins on the forehead.

In the confluent form of smallpox the eruption may appear a day earlier and all the symptoms are more severe. The pustules run together and form large brownish scabs, chiefly on the face and head, but also on the hands and feet. The face and neck are greatly swollen, the eyes are closed, the features are distorted. The patient complains of tension and burning of the skin; there is much thirst. The eruption may also appear in the mouth and throat. The secondary fever is high. Delirium may be quite marked. In fatal cases the pulse becomes rapid and feeble, and death occurs about the tenth or eleventh day or later.

In favorable cases, about the eleventh or twelfth day the pustules begin to break. The matter dries and forms crusts which slowly fall off, leaving the skin quite red and in many cases dreadfully scarred and pitted.

The crusts begin to drop off about the fourteenth day, but the process of desquamation may not be completed until the end of the third or fourth week, and the fever may persist during that period. There is a milder form of smallpox called varioloid, in which the symptoms

are usually milder and of shorter duration. Varioloid occurs in persons who have been vaccinated. Sometimes the eruption begins on the feet. In some cases it is confined to the feet and hands. Occasionally the eruption is extensive and the symptoms are severe.

The most severe type of smallpox is the hemorrhagic (bloody). It occurs in two forms. In one the case goes on in the usual way until about the ninth or tenth day, when blood makes its appearance in the pock. This form is sometimes called black smallpox. In the other form the eruption may be blood colored from the second day, and bleeding may take place from the nose or mouth or from the rectum. The face is greatly swollen and the eyes are deeply bloodshot. Death occurs during the first week, sometimes as early as the second day.

Before the characteristic eruption appears it is frequently very difficult to determine the existence of smallpox. It is easily confounded with other eruptive diseases. The important points to remember are the intense pain in the back, the high fever, and bounding pulse, all of which precede the eruption, and that when the eruption appears the fever and all the severe symptoms subside. The temperature before the eruption may be up to 105° or 106° F. (40.5° or 41.1° C.). When the eruption appears it begins to decline and within 24 or 36 hours is down to about 100° F. (37.7° C.). When the secondary fever sets in the temperature rises again.

Vaccination.—This procedure prevents smallpox. Every child should be vaccinated before it is 6 months old, and again when it reaches school age. If the vaccination does not take, the operation should be repeated until it is successful. A small papule should appear in 48 hours, which soon changes into a vesicle. This gradually enlarges, until at the end of one week it is the size of a finger nail. It is then of a whitish color and is surrounded by a reddish area. At this time the patient may have a slight fever, headache, or some disturbance of digestion. On the tenth or thirteenth day these symptoms have usually subsided, the vesicle begins to dry up, forming a scab, and the redness of the surrounding area diminishes and finally disappears. If the vaccination is kept dry and irritating substances, such as woolen shirts or coats, are not allowed to touch it, there is little danger of harmful germs gaining entrance through the wound. Some physicians advise the use of celluloid shields, but these shields are harmful as they exclude the air and are hot and uncomfortable. If care is taken not to break the vesicle, dressing is usually unnecessary; but if a dressing must be employed, the simpler the better. A little sterile vaseline or boracic-acid ointment, spread upon a piece of clean linen, generally suffices. This should extend beyond the inflamed area and be held in place by strips of narrow adhesive plaster.

If a person has not been vaccinated during childhood, he should have this operation performed immediately in order to protect himself from smallpox. No one can tell when he might come in contact with this disease, and if not protected by vaccination he is extremely liable to contract it. After an interval of about seven years a second vaccination should be performed, and it should be repeated until successful. Smallpox has been practically eliminated from some countries by vaccination.

Treatment.—The patient should be placed in a cool, well-ventilated room and strictly isolated; and every person who has been in contact with the patient should be immediately vaccinated. No one should be allowed to come in contact with him except the nurse or attendant and the nurse or attendant should not be allowed to come in contact with other persons. While in immediate attendance on the sick he should wear overalls and jumper and a head covering, to be removed when he leaves the room, and immediately put on again when he returns. Separate dishes and necessary utensils should be provided. The food should be placed at a convenient place near the door of the sick room where the nurse can come and get it. Nothing should be allowed in the room except the articles absolutely necessary. The soiled clothing should be wrapped in a clean sheet (or in a sheet that has been dipped in a 1 to 1,000 solution of bichloride of mercury) and the bundle placed in a kettle of water and thoroughly boiled. If there is a sufficient supply of bedclothing, the soiled articles should be destroyed by fire (burned). The patient must be kept thoroughly clean. Good nursing is very important.

DEATHS FROM SMALL POX IN COUNTRIES WITH COMPULSORY VACCINATION LAWS

SWEDEN	1
IRELAND	1
SCOTLAND	3
GERMANY	3.5
ENGLAND	16.

DEATHS FROM SMALL POX IN COUNTRIES WITHOUT COMPULSORY VACCINATION LAWS.

SWITZERLAND	18.5
BELGIUM	161
RUSSIA	231
AUSTRIA	510
ITALY	536
SPAIN	963

FIG. 91.

In the early stage, when the fever is high, place the patient in a cold bath, or give him a cold sponge bath, note the temperature of the body, and repeat the bath every three hours if the thermometer registers above 103° F. (39.4° C.). If the bowels are constipated, give small doses of Epsom salt, 2 teaspoonfuls, every two or three hours.

The food should be soft and nourishing and given at regular intervals. Cold drinks, lemonade, barley water, etc., may be freely given. Aspirin, 10 grains, may be given for the headache.

The pain and tension in the skin may be relieved by cold applications. A piece of lint, wet with a one-half of 1 per cent solution of carbolic acid, may be applied cold to the face and frequently renewed. Holes should be cut into the lint corresponding to the eyes, nose, and mouth. When the pustules begin to form it is a good plan to touch

each one with tincture of iodine (a camel's-hair brush may be used for the purpose), and a day later to puncture them with the point of a needle. The needle should first be boiled, and the point should then be dipped in tincture of iodine before making the puncture. When crusts being to form, olive oil or glycerin should be applied. If the hair is long it should be cut short early in the disease before the pustular stage begins. The eyes must be carefully cleansed several times a day, else blindness may follow. The mouth, throat, and nose also require attention. A saturated solution of boric acid may be used as an eyewash, a mouth wash, or a gargle (one teaspoonful of boric acid in a glass of water).

When the crusts and scabs drop off they should be carefully gathered up and burned. The patient should then have a daily bath with soap and water. When the case is ended the room and all exposed articles must be disinfected by burning sulphur (4 pounds to every 1,000 cubic feet of air space).

When the case occurs on shipboard, the ship, if near port when the disease breaks out, should be taken direct to the quarantine station, where the patient may be taken care of and the ship disinfected.

CHICKEN POX.

Chicken pox is a disease of children, but occasionally it occurs in adults. The child usually becomes sick 14 or 16 days after being exposed to the disease. The child is restless, has a slight fever, and complains of itching of the skin. A papular eruption appears upon the face, neck, or chest within 24 hours from the time the child is taken sick. In a short time the papules change to vesicles. These have the appearance of small blisters and are due to small quantities of liquid accumulating under the superficial layer of the skin. At first the vesicles are translucent but later are opaque as their contents become turbid. After a day or two the vesicles rupture, crusts are formed, which drop off in from 5 to 20 days. The vesicles are usually few in number and are found mostly upon the upper part of the body. They may, however, be thicker in places and may extend over the whole surface. Sometimes they are found in the mouth and throat. The temperature falls when the rash fades, and it is usually greatest when the eruption appears.

It is important that chicken pox should be distinguished from smallpox. It should be remembered that the former occurs principally in children; that the eruption appears in the first day of the disease; that it only involves the upper layer of the skin and rarely produces pitting; that it appears in crops, some of the vesicles drying up while others are beginning to form; that there is seldom headache or backache, and the fever is usually low. There is no secondary fever as occurs in smallpox when the pustules are formed.

The papule in smallpox is hard and shotlike and has a very different feeling from the soft, reddish spot of chicken pox. When the vesicle is ruptured with the finger it can be seen that it involves only the superficial layer of the skin, whereas the ruptured pustule in smallpox leaves an ulcer extending through the true skin.

In spite of the distinctions between smallpox and chicken pox mentioned in the above paragraph it is often difficult to distinguish between a mild form of smallpox and chicken pox, and a physician should always be called in to see the patient if smallpox is present in the community.

Prevention.—A child having this disease should not be allowed to go to school. If the child is an inmate of an orphan asylum or other children's institution it should be quarantined while chicken pox is prevalent. In private houses quarantine is unnecessary unless the other children are delicate, and it is especially desirable that they should not catch the disease. The disease is contagious as long as any crusts are present.

Treatment.—The child should be put to bed, and to relieve the itching sponged with warm water to which a small quantity of carbolic acid (half a teaspoonful to the pint) is added. The carbolic acid should be added while the water is hot, and care should be taken that it is dissolved in the water before using the water. Carbolized vaseline (carbolic acid 3 grains, vaseline 1 ounce) is often efficacious in relieving itching. A warm bath should be given each day until the scabs come off.

MEASLES.

Measles is an acute infectious disease which most commonly attacks children, but it may occur in adults. It usually spreads from person to person by exposure to a patient with the disease, as when going into the room where he is sick, riding in the same street car, or being in the same schoolroom. It generally makes its appearance from 12 to 14 days after exposure. One attack is nearly always a protection against a second one.

Symptoms.—It begins like an ordinary cold. There may be an initial chill; the patient's face looks flushed and sometimes slightly swollen about the nose and eyes and the eyes are reddened. There may be a tendency to sneeze, and an examination of the throat will disclose a reddening of the mucous membrane. The rash often appears first in the throat. Some cough may be present at the onset, with more or less headache. Fever is present with the onset of these symptoms. The eruption on the skin develops on the third or fourth day of the fever. It may be most marked on the forehead or about the ears, looks like fleabites, and gradually spreads over the entire body. The patient has considerable cough, with expectoration. In

children there is some liability to a form of pneumonia called broncho-pneumonia, which renders the disease much more dangerous. It may also have the complication of diarrhea and vomiting, due to implication of the bowels and stomach.

Prevention.—As soon as the case is discovered the patient should be put in bed and isolated in a room from which children are excluded and only those adults admitted who are directly concerned in the care of the case.

Treatment.—It is necessary to prevent the patient from becoming chilled, and he should therefore not be exposed to drafts, but fresh air should be admitted to the room. If the weather is cold, he should be provided with plenty of covering.

The treatment of an ordinary case of measles is practically nil, as little or no medication is required. If there is much irritation of the eyes, the room should be darkened and the eyes washed with a saturated solution of boric acid in warm water. Take a glass of warm water and put into it all the boric acid it will dissolve and use it as a wash for the eyes, keeping it covered to prevent dust or other impurities getting into the solution. Everything applied to the eyes should be scrupulously clean.

If the skin is dusky and the eruption is not well marked, the patient may be enveloped in sheets or blankets wrung from hot water, but care must be exercised that he does not become chilled afterwards. Only sufficient covering should be used to render the patient comfortable.

If the cough is very troublesome, a tablet of Brown Mixture or a half teaspoonful of mixture pectoralis (expectorans) N. F. may be given every three hours.

After the eruption has disappeared and the peeling of the skin has begun the patient should bathe daily in order that the skin may be freed from the scales.

During the period of the disease the patient may be fed on broths, milk, soft-boiled eggs, etc.

Disinfection is not now considered necessary after measles, as it is believed the disease is transmitted only by contact with a sick person, and experiments show that there is little danger of contracting the disease after the eruption appears. If it is desired to disinfect the room after the patient recovers, the following procedure should be carried out:

The bedclothes should be boiled 20 minutes or soaked in a 3 per cent solution of carbolic acid or compound cresol for one hour. (See p. 104.) All the openings of the room should be closed, and it should be fumigated with formaldehyde gas made by placing formalin in a 10-quart pail and pouring permanganate of potash onto it. One pint of formalin and one-half pound of potash should be employed for every 1,000 cubic feet of air space. The time of exposure should

be four hours, after which the doors and windows should be opened and the gas allowed to blow out. The room should then be thoroughly cleaned and aired for several days. Mattress, curtains, rugs, and carpet should be taken out of the room after fumigation, hung in the sunshine, and well beaten before being used again.

SCARLET FEVER.

Scarlet fever is a communicable disease characterized by fever, sore throat, and a red rash. When the disease is mild it is called scarlatina or scarlet rash. The incubation period is from two to four days. It begins with headache, vomiting, faintness, and occasionally convulsions in children. The mouth and throat are deeply congested. There is pain on swallowing or talking. The tongue has the color of a ripe strawberry. The inflammation may extend from the throat to the ears. The glands of the neck often become swollen. The rash appears on the second day of the disease, and in mild cases may be the first symptom noticed. It occurs as a diffuse redness, which, upon close observation, will be found to be due to fine red papules. After four or five days the skin commences to shed. Sometimes it is cast off in large flakes.

Complications.—Inflammation of many organs of the body may follow scarlet fever. There may be pneumonia, pleurisy, ulceration of the throat, abscesses in the neck, and inflammation of the lining membrane of the heart. Nephritis or inflammation of the kidneys frequently occurs from the second to the fourth week. In this complication there is diminution or suppression of urine, with puffiness under the eyes, swelling of the hands and ankles, or general dropsy. There may be convulsions, and the case may quickly terminate fatally. In other cases the secretion of urine is reestablished and the person either recovers entirely or the disease persists in a chronic form. There may be pain, swelling, and redness of the joints. Careful watch should be kept for symptoms of inflammation of the middle ear. These are pain in the ear, tenderness over the bony prominence behind the ear, and drowsiness. The child may moan in its sleep and be hard to arouse. If the drum membrane breaks, the pent-up pus escapes from the ear opening, and if the inflammation is mild the symptoms then abate; otherwise an abscess forms in the bony cells behind the ear, which if not opened may break into the cranial cavity or spread downward along the deep tissues of the neck.

Varieties.—Mild cases may not be recognized until some unusual occurrence, such as a swelling in the neck, the shedding of skin, the onset of nephritis, or illness in another child who has been in company with the patient, calls attention to the fact that the child has had an attack of scarlet fever. The rash may be absent or present on only a portion of the body. The mild form may give rise to a

severe attack in another person. In a malignant case there may be high fever, delirium, coma, gangrene of the throat with a foul discharge from the nose and mouth, the patient dying in one or two days.

Death is rare in cases that receive proper care and attention, although many persons succumb to the complications produced by scarlet fever, and it is often the starting point of chronic disease of the heart, ears, or kidneys, which cause death in afterlife. It is more fatal to children less than 6 years old.

Prevention.—All persons suffering from scarlet fever should be isolated and should not be allowed to communicate with other people, except those attending upon them, as long as there are any discharges from the mouth, throat, ears, or other parts of the body. Physicians attending upon scarlet fever patients should wear a gown which covers their clothing when going into the sick room and should thoroughly disinfect their hands after each visit. The person caring for the sick child should not mingle with other persons, and all dishes should be scalded before being again used.

Treatment.—Keep the room warm, with a window partly open for ventilation. Put the patient in bed but do not cover him up with too much bed clothing. If the child has convulsions, give him a hot bath; if the fever is high, sponge him off with cold water. If there is vomiting, apply a small mustard plaster over the upper part of the stomach and give him a cup of hot water in which has been placed a teaspoonful of sodium bicarbonate. If there is severe headache, give 10 grains of aspirin if the patient is an adult; if a child, give 3 to 5 grains. Cold compresses should be applied to the neck. The mouth should be rinsed frequently with a saturated solution of boric acid (one teaspoonful of boric acid in a glass of water) and the throat kept clean by gargling with a solution composed of peroxide of hydrogen one part, water two parts. This solution may also be applied with a swab made by tying a small piece of cotton onto a small stick. If no peroxide of hydrogen is obtainable, a salt solution made by placing a teaspoonful of salt to a pint of water may be employed in its place. One tablet of calomel, each one-half of a grain, should be given every half hour until four are taken. This should be followed in four or five hours by a Seidlitz powder or a dose of salts. If there is earache, hot compresses should be applied to the side of the head, and ear drops (carbolic acid 1 fluid dram, glycerin 7 fluid drams, mixed well together) should be placed in the ear. If possible, a physician should be called immediately; if the drum membrane is opened early the hearing of the patient may often be preserved.

The patient should have a light diet with plenty of water to drink, especially if there is any sign of dropsy. If this develops, hot com-

presses should be applied to the back, and hot water (temperature from 110° to 120° F.) should be injected slowly into the bowels, several quarts at one time. If the excretion of urine is greatly diminished, it may be necessary to put the patient into a hot pack. This is done by wringing out a sheet in hot water and immediately wrapping the patient in it and covering him with blankets. If electricity is available, the patient may be made to sweat by placing several light bulbs, connected with lamp socket, between the blankets on the patient's bed and turning on the light. The patient should not be considered well until the skin has ceased peeling and all discharge of pus has ceased. He may then be allowed to mingle with other persons. The room and its contents should be disinfected as directed under "Measles."

GERMAN MEASLES.

German measles is an acute contagious disease of mild character that comes on from 10 to 16 days after exposure to the person who is suffering from it.

Symptoms.—The temperature seldom rises over 100° F. The rash first occurs upon the face. It consists of pale red papules, which do not assume any regular form or shape. There is considerable itching of the skin. The rash appears on different parts of the body in succession, fading in one part while appearing in another. It lasts from two to five days and is followed by a slight peeling of the skin. The glands of the neck may become enlarged and there is frequently sore throat and a dry cough, but these symptoms are not apt to be severe.

Prevention.—The child should be isolated and the same precautions taken against the spread of the disease as noted under scarlet fever. It does not spread as rapidly amongst children as measles, and the percentage of adults attacked is larger than in that disease.

Treatment.—The treatment prescribed for measles is applicable to this disease.

WHOOPING COUGH.

Whooping cough is a contagious disease characterized by an inflammation of the nose, throat, and bronchial tubes, associated with a peculiar spasmodic cough, ending in a long-drawn-out inspiration accompanied by a sound known as the "whoop," from which the disease gets its name.

It is caused by a germ present in the discharges from the nose and mouth, which is disseminated through the air during the spells of coughing. Most cases occur before the tenth year, and one attack is usually protective for the rest of life. It is believed that girls are more liable to contract the disease than boys.

76912°—19——10

Symptoms.—The incubation period is from 4 to 14 days. In the beginning the symptoms are like those of a severe cold. There is redness of the lining membrane of the nose and throat, profuse discharge from this membrane, and a hoarse, dry cough. The face is swollen, the eyes suffused and watery, the eyelids swollen and pink in color. The cough is severe and out of all proportion to the other physical signs. There is fever, but the temperature does not, as a rule, remain above normal after the first few days. After these symptoms have existed for 10 days or 2 weeks the cough changes in character. It occurs in paroxysms which consist of a number of short, quick coughs, followed by a long-drawn-out inhalation of air accompanied by the noise known as the whoop. The coughing spell often terminates with vomiting.

Inflammation of the kidneys may be present, and the child generally loses fat and presents a run-down appearance. Consumption not infrequently follows an attack of this disease, and great care should be taken to prevent a child suffering from whooping cough from coming in contact with consumptives. The exhaustion caused by whooping cough makes it more liable to contract consumption.

Prevention.—As patients continue to spread infection six weeks after recovery, it is very difficult to control the spread of whooping cough. As, however, it is such a distressing disease, every effort should be made to keep well children from associating with those having the disease. Children with the disease should be allowed to go outdoors, but should not be permitted to go to school or to moving-picture shows or ride in street cars or in any public vehicle where they may come in contact with other children.

Treatment.—An outdoor life during the course of the disease should be encouraged, and if convenient the child should be taken to the seashore. Children in cities, on account of dust and the presence of harmful gases in the atmosphere, suffer more than children in the country. The child should gargle his throat several times a day with a solution of hydrogen peroxide (hydrogen peroxide, 1 part; water, 3 parts). A broad bandage placed tightly around the chest and stomach may make the patient feel more comfortable.

MUMPS.

Mumps is an acute infectious disease usually affecting children, but may occur in adults. It affects the partoid gland, which is situated just below the ear on each side. It is conveyed by contact from one patient to another; hence the patient should be isolated in a room, and children should not be exposed to the disease. Only the adults directly in charge of the case should be admitted to the room unless they have been protected by a previous attack. An attack usually comes on about 15 days after the exposure to the disease.

Symptoms.—The chief symptoms are pain and swelling in the parotid region under the ear. Movements of the jaw, such as chewing and talking, will be painful. Swelling may occur on one or both sides, but nearly always both are involved. It is worst about the third day, and may gradually disappear after that. It is usually a mild disease, but swelling of the testicle is a frequent complication in the male.

Treatment.—Light diet, such as broths, eggs, milk, rice puddings, etc., should be given. Sour food and acid drinks will be found to give considerable pain if taken in the mouth; hence they should be avoided. Hot applications may be placed over the swollen glands if there is very much pain. No internal medicines are indicated. If the bowels are constipated, a tablespoonful of Epsom salt may be administered with benefit.

CONSUMPTION (TUBERCULOSIS).

Consumption, or, as it is often called, tuberculosis, is due to the tubercle bacillus, a small organism which attacks various parts of the body. The infection may be general or it may be localized to a particular portion of the body, such as the lungs, the intestines, the bones, the glands, the nervous tissue. The only form that will be considered in this book is consumption (tuberculosis) of the lungs.

Symptoms.—The first noticeable symptom of tuberculosis of the lungs may be a hemorrhage, the blood being coughed up, but the onset is usually gradual. The patient has a slight cough, feels weak, and indisposed to do anything, loses weight, and has very little appetite. If the temperature is taken in the evening, it will often be found that he has a slight fever. In a few weeks or months the emaciation becomes more marked, the fever is higher, there are sweats at night, severe cough, shortness of breath, and a large amount of mucopurulent matter is expectorated. There may be severe diarrhea from extension of the disease to the bowel, or the larynx may be involved, causing the voice to be husky and swallowing extremely painful. The patient's sleep is disturbed by the coughing spells, which are violent and protracted. As the disease progresses the symptoms increase in severity and the patient is confined to his bed until death brings him relief from his suffering.

Prevention.—Many physicians believe that consumption is contracted only during childhood and that a large number of persons become infected with the organism and recover. This belief is strengthened by the fact that healed lesions of tuberculosis are often found in persons who have died of other diseases. The presence of tuberculosis in adults is explained by the theory that the germs of this disease gain a foothold in the body in childhood, but do not cause disease until later in life. Tubercular germs which enter the

system during childhood may be encapsulated and become active at any time that the resistance of the body is lowered by deficient nourishment, overwork, or some other exhausting condition. It can thus be readily seen that it is extremely important that children should not mingle with adult consumptives. This is especially the case as children, not being usually cleanly in their habits, are apt to get dust and dirt containing tubercle bacilli on their hands and become infected through their habit of putting their fingers in their

HOW THE GERMS OF CONSUMPTION ARE CARRIED FROM THE SICK TO THE WELL.

Consumptive spitting on floor. Flies feeding on it, carry the germs of the disease to food.

The spit dries and careless sweeping, dusting or draughts cause the germs to float in the air.

The germs may enter the bodies of children playing on the floor, through sores or wounds.

Others may get the disease by breathing or swallowing the germs. Spray given off in sneezing or coughing, contains germs in a moist and active state.

Putting food, money, pencils, etc., into the mouth after a consumptive has poisoned them with his spit.

FIG. 100.
(New York State Department of Health.)

mouths. Another danger from which children should be protected is ingestion of tubercle bacilli in milk obtained from diseased cows. For this reason it is important that all cattle should be tested to ascertain if they have tuberculosis in order that no milk from such cows should be used. In addition it is best to pasteurize milk, as this process will kill tubercle bacilli if any are present in the milk. For a description of the process, see page 190.

Tuberculosis is also liable to develop in children recovering from measles, whooping cough, pneumonia, scarlet fever, and other acute

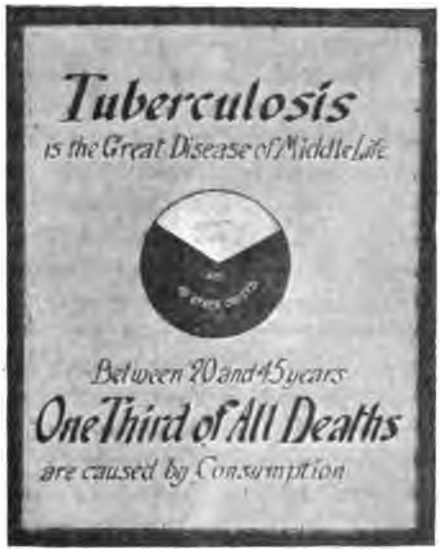


Fig. 93.—(By courtesy of the Metropolitan Magazine.)

Fig. 94.—(By courtesy of the Metropolitan Magazine.)

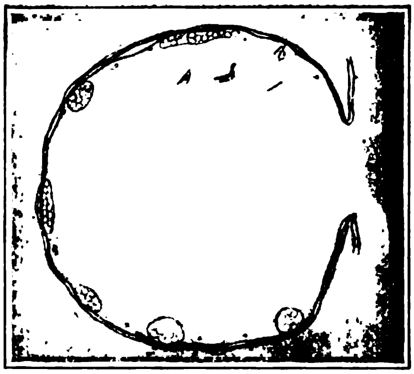


FIG. 95.—Consumption. Air cell of the lung with the first accumulation of tubercle bacilli.

FIG. 96.—Consumption. Pulmonary air cell with inflammation from tubercle bacilli.

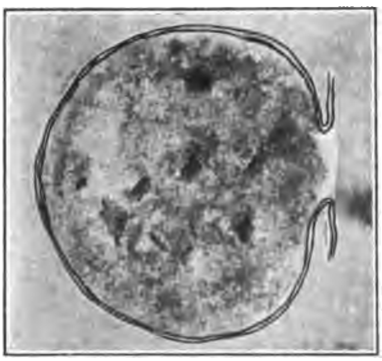


FIG. 97.—Comsumption. Cheesy destruction of a pulmonary air cell.

FIG. 98.—School girl with adenoids.

Fig. 99.—An exceptionally dangerous tuberculous cow. Directly after this cow was removed from a dairy herd, because she reacted with tuberculin and not because she showed symptoms of tuberculosis, a small nodule about the size of a pea was discovered under the skin of her udder. Examination of the milk from the quarter of the udder in which the nodule was located revealed the presence of numerous virulent tubercle bacilli. The cow was permitted to live some time, because it was desirable to use her infected milk for special investigations.

diseases. Children who have suffered from them should be kept out in the open air, given plenty of food, and should not be required to go to school until they have recovered their strength. Children having adenoids or enlarged tonsils should have the same removed, as the obstruction to breathing caused by these structures encourages the development of tuberculosis. If the disease attacks the intestinal canal, the bones, or the glands of the neck the children so attacked should receive careful treatment by a physician or surgeon in order that they may be cured.

There is little danger of a person suffering from consumption infecting others in the same house if he will take the proper precau-

A CAREFUL CONSUMPTIVE—NOT DANGEROUS TO LIVE WITH.

FIG. 101.
(New York State Department of Health.)

tions. The danger lies in the sputum, which, after drying, is inhaled by others in the form of dust. To prevent this a consumptive should never spit upon the floor or ground. The sputum should be caught on tissue paper, which should be placed after use in a paper bag. This bag and its contents should be burned in a few hours before the sputum has had time to dry. If the sputum is profuse, a cup with a cover may be employed, but this cup should be boiled for half an hour several times each day. It is well also to keep the cup partially filled with a 3 per cent carbolic acid or compound cresol solution.

Handkerchiefs or pieces of cloth should not be used for wiping the mouth or nose unless they are boiled immediately afterwards. Sheets

and pillowcases that may be soiled during the night by the sputum should be boiled the first thing in the morning. Towels used by the patient should be boiled immediately thereafter. The patient should have separate dishes and these should be sterilized by boiling after each meal. He should keep his face clean shaved, and he should kiss no one, nor should he under any circumstances sleep in the same bed or the same room with other persons. After death the room should be disinfected as described under "Measles."

Treatment.—A person who has consumption should live out of doors. He should not go into a house except to dress or to get his meals. At night he should sleep on a porch, balcony, or lean-to,

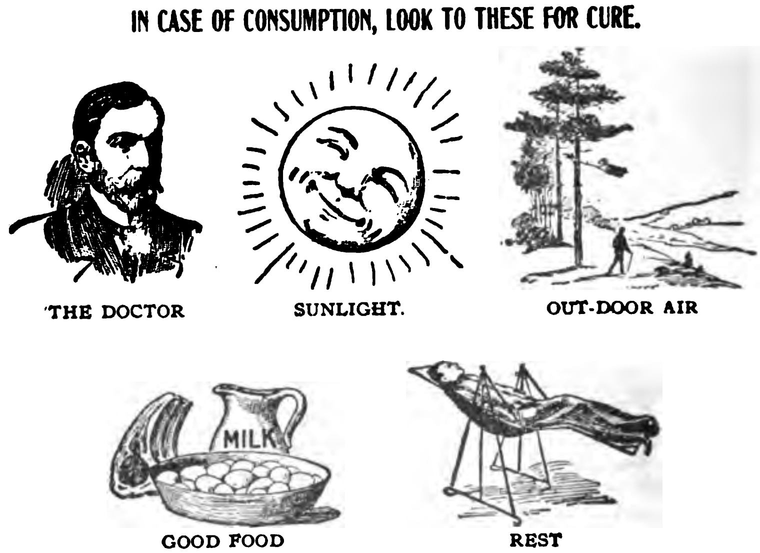


FIG. 102.
(New York State Department of Health.)

where he will be in the open air. Many persons who conscientiously follow this treatment recover.

There is no medicine that will cure consumption and medicine should only be used to alleviate symptoms in the latter stage of the disease. A medicine containing an opiate such as mistura pectoralis (expectorans), N. F., is sometimes necessary in hopeless cases to control the cough and allow the patient to get a little sleep. Sleeping in the open air will often prevent the cough and make it unnecessary to give a cough mixture. If night sweats are severe, a little atropin sulphate, one or two tablets, each $\frac{1}{120}$ grain, given during the afternoon and at bedtime will often prevent them. The patient should be kept in bed day and night if he has fever, and he should not be allowed to get up and walk around until several weeks after all fever has subsided. The diet should be nutritious and generous,

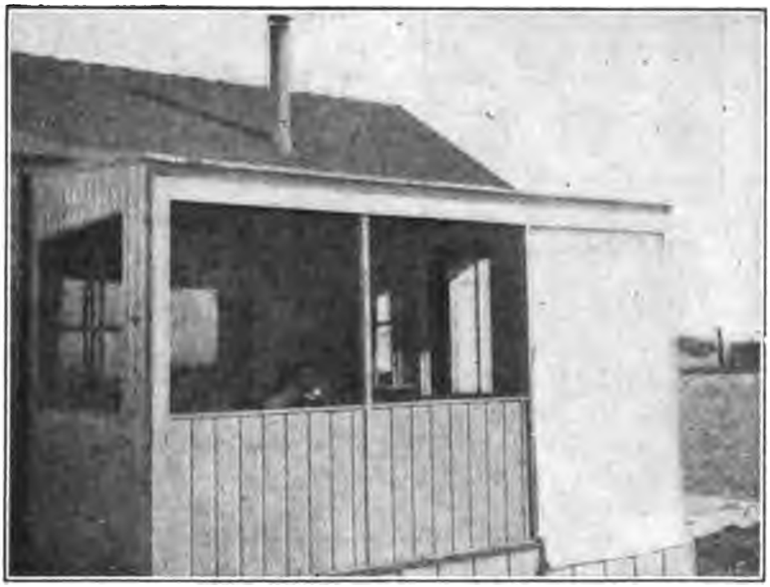


FIG. 103.—A good method of building a porch on the back of a cottage for country use. Loaned by the Journal of the Outdoor Life.—Carrington.

FIG. 104.—A cheap porch protected by awnings, built on the roof of a first-story veranda.—Carrington.

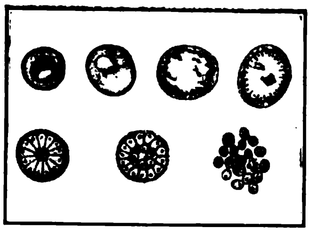


FIG. 105.—Parasites of tertian malaria. (After Thayer and Hewetson.)

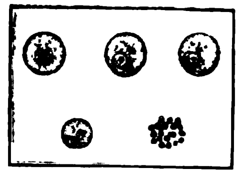


FIG. 106.—Parasites of estivo-autumnal malaria. (After Thayer and Hewetson.)

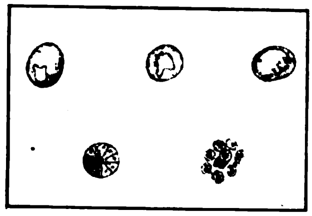


FIG. 107.—Parasites of quartan malaria. (After Thayer and Hewetson.)

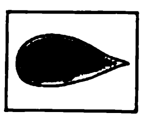


FIG. 108.—Fertilized female malarial parasite (Zygote). (After Craig.)

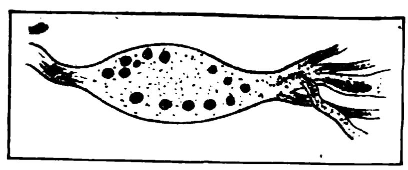


FIG. 109.—Stomach of mosquito with oocysts. (After Craig.)

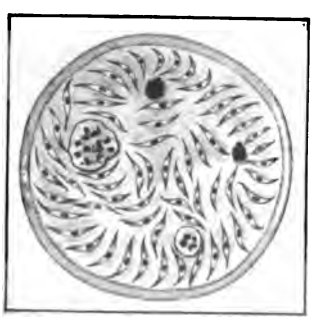


FIG. 110.—Sporozoites in oocyst. (After Craig.)

FIG. 111.—Sporozoites. (After Craig.)

and such articles as milk, eggs, fish, and fowl, together with an abundance of fat, should be eaten. A mixture of raw eggs and milk stirred together is recommended. Eight or twelve eggs and the same number of glasses of milk may often be taken daily in this way.

MALARIAL FEVER.

Malarial fever is caused by minute organisms, which, upon being introduced into the blood stream, attack and destroy large numbers of red corpuscles. After entering a corpuscle the organism increases in size until it occupies nearly the whole of the disk, when it separates into a number of segments, each of which when set free may attack another corpuscle, and the process is repeated. The period of time which elapses from the entrance of the germ into the corpuscle to the breaking down of the same and the extrusion of the young parasites varies from 24 to 72 hours, depending upon the variety of the parasite which is present. The chill of malarial fever corresponds to the disintegration of the corpuscles and the release of the new forms. A poison is also liberated at this time, and the action of this poison upon the system accounts to a great extent for the chill.

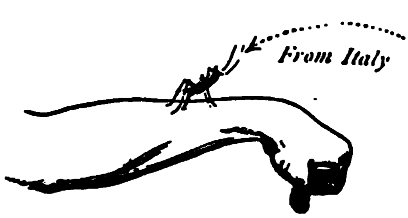


FIG. 112.—Germs of malaria were sent from Italy to England in a mosquito, and a physician who was bitten by the mosquito developed malaria. (Ritchie's "Primer of Sanitation.")

After malarial organisms have existed in the blood for a considerable time, ovoid and crescent shapes begin to appear. These forms are quiescent and are not known to undergo further development in the human body. When, however, during the process of biting, they are drawn up into a mosquito's stomach through its bill, other changes take place, which finally result in a number of other organisms (sporozoites) finding themselves in the salivary glands of the mosquito. If this mosquito now bites a person, a portion of the secretion of this gland containing these organisms is injected into the wound caused by its bite, and the person thus becomes inoculated with the malarial organism and contracts the disease. This will not occur, however, until a sufficient time has elapsed to allow the new forms to develop and find their way into the saliva of the mosquito. This usually takes from 10 to 14 days from the time the mosquito bites the person infected with malaria.

Malaria is carried only by certain kinds of anopheles mosquitoes. The female alone is capable of transmitting disease; it is doubtful if the male bites at all. Anopheles mosquitoes are distinguished by their palpi, which are nearly as long as their bill. The wings are

spotted or have a dusky hue. When the insect rests upon a flat surface it extends its body in a straight line instead of humping itself up like other kinds of mosquitoes. The male is known by its antennæ, which are large and covered with fine hairs, giving them the appearance of plumes. (See fig. 51.)

Symptoms.—There are two varieties of malarial fever—intermittent and estivo-autumnal malarial fever. The tertian form is the most common of the intermittent variety. The parasite in this form is known as the *Plasmodium vivax.* The time occupied by this organism in developing in the blood corpuscle is 48 hours, the new parasites being released at the end of that period.

The chill, therefore, occurs every other day. In some cases there is a double infection with this same organism and a chill occurs every day. This is called the quotidian type. In another type, known as the quartan, the chill occurs every fourth day, and is due to a parasite called the *Plasmodium malariæ.*

A malarial chill consists of three stages—the cold, the hot, and the sweating stage. The attack may be sudden or it may be preceded by a feeling of uneasiness, a desire to stretch the limbs and yawn, headache, loss of appetite, and sometimes vomiting. The chill may be of any degree of severity. Patients sometimes complain only of chilliness or of a creeping sensation of coldness over the back. More frequently the chill is well marked; the feeling of cold spreads all over the body, the teeth chatter, the patient shivers, and his whole body shakes. This cold stage may last from a few minutes to an hour or longer. The hot stage gradually comes on as the cold stage subsides, and soon there is a feeling of intense heat. The face becomes flushed, the pulse full or bounding, the headache continues, and the patient is in a high fever. This stage may last from half an hour to four or five hours, when perspiration appears, first on the forehead and gradually over the entire body, and the sweating stage is fully established. With the appearance of perspiration the fever declines, the distressing symptoms gradually cease, the patient experiences a feeling of great relief, and soon falls into a refreshing sleep. The duration of the sweating stage varies from one to three hours.

The perspiration may be slight or very profuse. At the end of the sweating stage the patient may be greatly prostrated or may feel quite well and able to be up and about until the beginning of the cold stage of the next fit, 24, 48, or 72 hours from the beginning of the first.

Estivo-autumnal malarial fever is due to the *Plasmodium falciparum.* This variety of malarial fever is more apt to run an irregular course than intermittent malarial fever. The paroxysm, consisting of chill, fever, and sweat, may be longer and the fever may be con-

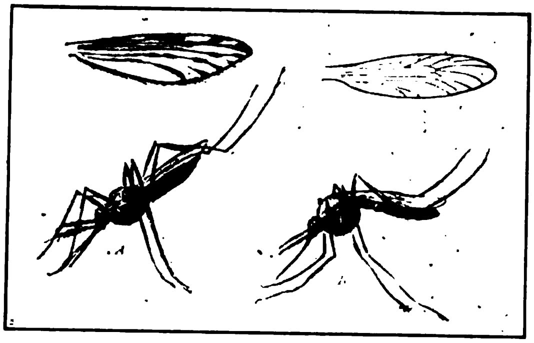


FIG. 113.—*A* is the Anopheles mosquito (the mosquito that carries malaria), showing its position while resting, and the spots on its wings. *B* shows the common mosquito (Culex).

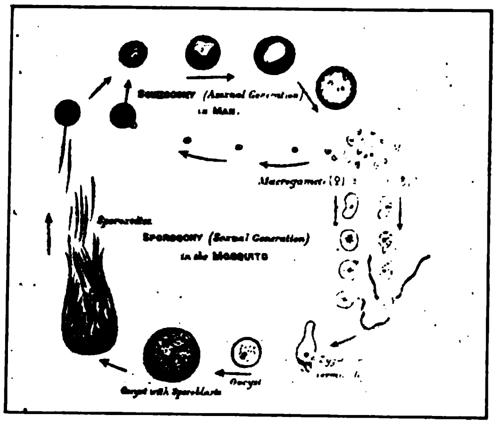


FIG. 114.—Diagram illustrating the human and mosquito cycles of existence of the malaria parasite. (From Martin's General Pathology.)

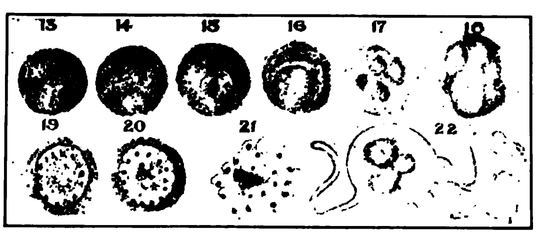


FIG. 115.—Malaria. The tertian parasite.

FIG. 116.—Chronic malaria causes great enlargement of the spleen.

FIG. 117.—View showing arm against mosquito bar so that mosquitoes have access to individual.

FIG. 118.—Tucking in the mosquito bar.

tinuous or only drop in the morning hours. Some cases closely resemble typhoid fever, consumption, abscess of the liver, or abscess of other parts of the body. Such cases are difficult to distinguish from these diseases. If this variety of malarial fever is neglected or improperly treated, pernicious symptoms may prove threatening and serious.

There are several types of the pernicious form of estivo-autumnal malarial fever: The cerebral type in which there is intense headache, high fever, wild or perhaps muttering delirium, rapidly passing into unconsciousness, and death may occur within a few hours of the beginning of the attack; the algid type in which there is severe vomiting and purging, stools are numerous, watery, and large, pulse weak and rapid, body cold and face blue and pinched; the pneumonic type in which there is congestion and a pouring out of fluid into the bronchial tubes which if not relieved will cause death.

Hemorrhages from different parts of the body, but especially from the nose, mouth, gums, stomach, or intestines, may occur in any form of estivo-autumnal malarial fever. When there is blood in the urine, the latter has a dark color and is known as "blackwater disease." At one time it was thought that "blackwater disease" was caused by the quinine administered for the cure of malaria, but those physicians who have had most experience now agree that this is not true, and many cases occurring in the employees along the Panama Canal Zone have been cured by quinine.

Chronic malaria is due to improper treatment. No thoroughly treated case of malaria becomes chronic. Wherever a chronic case is found it is evidence of neglect of treatment or of insufficient protection from the bites of malarial mosquitoes. In this condition the patient is pale, jaundice may be present, and the body swollen from dropsy, the liver and spleen enlarged, the latter causing the so-called "ague cake," which can be felt in the left side of the abdomen.

Prevention.—Every possible means should be employed to get rid of anopheles mosquitoes. The grass and weeds around the house or likely breeding places should be kept short in order that they can obtain no shelter from the wind and hot sun. The former blows them away, and if exposed to the rays of the latter they die. Pools and marshes in which they breed should be filled in or drained, or, if this is impracticable, oiled, as described on page 56. Collections of water around the house, if not disposed of at once, should be screened or oiled. As the malarial mosquito bites mostly at night, it is important that the house should be thoroughly screened. The method of doing this is shown on page 18. Persons should not go out of the house in the evening if it can be avoided. Mosquito bars should be used if the house is not screened, but they afford less protection than good screening. A mosquito bar should not have a

slit up the side, nor should it go over the head and foot boards of the bed. It should hang from the ceiling and be tucked in all around the mattress. If allowed to touch the floor, mosquitoes may crawl under it or a breeze may blow it up and allow mosquitoes to get under it. The bed should be sufficiently large for a person to lie in without coming in contact with the mosquito bar, as otherwise a mosquito may bite the person through the netting.

Persons having malarial parasites in their blood should be protected from mosquitoes, for if a mosquito should bite a person so infected some of the organisms may be sucked up into its stomach and, after undergoing the changes related above, be injected into the body of a well person with which the mosquito might come in contact. It is important, therefore, that everyone having malarial parasites in his blood should be under the care of a physician and should receive treatment until all of these parasites have disappeared. It has been shown that in temperate regions malarial organisms are carried over from one season to another in the blood of people who have been suffering from the disease, and it is these so-called "carriers" who spread the disease from one community to another and who keep it alive during the cold weather. It has been found that mosquitoes caught early in the spring do not contain malarial organisms, but that these forms are developed in their bodies after the mosquitoes have had an opportunity to bite persons whose blood is infected with the organisms.

Cases of malarial fever
per 1000 men per year.
BEFORE QUININE, 275
SINCE QUININE, 49

Fig. 121.

Healthy persons can guard against contracting malaria by taking quinine. Six grains every day will be enough, although some physicians administer 10 grains twice a week, the second dose to be taken the day after the first, or 15 grains every eighth and ninth day. The taking of quinine is a procedure of vital importance for the protection of persons from malaria in tropical countries and in the Temperate Zones, where malarial mosquitoes abound.

Treatment.—When a chill occurs, the patient should at once be wrapped in blankets and be given hot drinks. Hot-water bottles, heated bricks or stones wrapped in cloth or in a separate piece of blanket, should be placed at the feet. Mustard plasters may also be applied to the extremities and over the region of the heart.

During the hot stage cold drinks may be administered; if it is severe, a tepid bath in a tub or by means of a sponge may be given. If the temperature is very high, 105° or 106° F., a cold bath should be given. (See p. 90.)

As soon as the sweating stage begins 10 or 15 grains of quinine should be taken, and along with this, if the bowels are not freely

open, a calomel tablet, one-tenth grain each, should be given every 15 minutes until 10 have been taken. Every six hours thereafter the patient should take 5 grains of quinine for two or three days and then 5 grains three times daily for the next two weeks.

If vomiting occurs, a mustard plaster may be placed over the region of the stomach, above the navel, and cracked ice may be given by the mouth. Headache may be relieved by cold applications or by 10 grains of aspirin taken with a cup of hot tea.

In pernicious types of malarial fever the treatment should be more active. No time should be lost in giving the quinine; 20 grains should be given immediately, with 2 grains of calomel. A physician should be summoned if the services of one can be obtained, as dilute solutions of quinine may have to be injected into the patient's veins in order to save his life.

YELLOW FEVER.

The mosquito which conveys yellow fever from one person to another is a striped black and white mosquito, *Ædes calopus*, and therefore the disease only occurs where this mosquito abounds. Moreover, the mosquito must have been previously infected by biting a person ill with the disease during the first few days of his illness. An interval of about 12 days or more after this bite appears to be necessary before the mosquito is capable of communicating the disease to a person.

Symptoms.—The onset in yellow fever is sudden. It frequently comes on at night or in the early morning. The patient is taken with a chill, headache, a pain in the back, and fever. The pulse is rapid at first, but afterwards falls, even though the temperature remains high. The eyes are injected, the skin has a slight flush, and the upper lip is often swollen. Albumen is often present in the urine as early as the second day. The test for albumen has been described on page 170. Jaundice appears early, and is especially noticeable as a yellowness of the eyes. The stomach is irritable and the bowels constipated. The fever lasts for two or three days and is succeeded by a period of calm. In mild cases the fever does not return, but in others the temperature again rises after a few hours and severe symptoms set in. The pulse is slow and weak, the jaundice deepens, and the vomiting increases. The vomited matter may consist of altered blood of a coffee-ground color, whence the name black vomit which has been given to this condition. The urine is scanty and albuminous and may be entirely suppressed. The strength rapidly fails, and the patient dies from exhaustion.

Diagnosis.—It is often difficult to tell yellow fever from malarial fever and dengue. Great care should be taken to determine as far as

possible the disease from which the patient is suffering, as the treatment is different in each case and a mistake may be followed by serious results.

The yellow fever chill usually occurs in the night or early morning; the chill of malarial fever may take place at any time during the day. The yellow fever chill is much less severe than the malarial chill. Jaundice come on early in yellow fever and is of a much lighter color than in malarial fever. If the malarial fever is of the intermittent variety, there will only be fever for a few hours and the patient will feel comparatively well until the next paroxysm takes place. It is often difficult for the layman with the facilities available to distinguish between these two diseases.

Yellow fever and dengue are similar, but the pains in the latter disease are much more severe. There is seldom jaundice or albumen in the urine in dengue and the skin eruption helps to distinguish between the diseases.

Prevention.—The patient should be immediately isolated in a screened room, as it is important that no mosquito should be allowed to bite him during the first few days of his illness, as one of them may become infected with yellow fever and other members of the family may subsequently be given the disease by being bitten by it. If the patient dies during the first three or four days of his illness, the room should be immediately fumigated with sulphur (see p. 65) for two hours in order to kill any mosquitoes that have come into the room and become infected. If the patient is alive after this period he should be carefully moved out of the room for a few hours, the room fumigated, and then the patient returned to it. Great care should be taken, however, in moving the patient, as the least exertion may be followed by a fatal result. He should be kept flat on his back and not allowed to sit up.

A vessel arriving at a port where there is yellow fever should, if possible, anchor at a point that is too far away for the mosquitoes to fly on board, and it should be so placed that they will not be blown aboard by the prevailing winds. It should be remembered that mosquitoes may be brought to the vessel by bumboats on fruits and vegetables or on the coats of persons in such boats. These boats should, therefore, be warned off and told to keep away. If boats have to come alongside, their contents and occupants should first be freed from mosquitoes. As the yellow fever mosquito bites in the day time as well as night, shore leave should not be granted to the crew in yellow fever ports. If the vessel has to go to the dock or if it is impossible to keep mosquitoes off it, the living quarters should be screened and measures described on page 64 should be taken to prevent their breeding on board. A person on board who has fever

or feels ill should immediately be placed in a screened room until it is ascertained that he is not suffering from yellow fever.

The yellow fever mosquito is a domestic mosquito and breeds in small collections of water, in old tin cans, buckets, barrels, cisterns, and other containers around dwellings. It is therefore important that such breeding places should either be eliminated or screened. The methods for the eradication of mosquitoes are described on page 56.

Treatment.—As soon as the attack of yellow fever begins, place the patient at rest in bed on a blanket, and immediately give him a hot footbath. The foot tub shuld be half full of warm water, to which a pound of mustard may be added. The patient's feet and legs are then placed in the water, and a quantity of hot water is added, so as to make the bath as hot as he can stand it. While it is being given the entire body of the patient should be covered with blankets, and he should drink hot tea. After the footbath is removed, the patient should be allowed to perspire for 10 minutes. His body must then be quickly dried and wrapped in a fresh blanket. A 5-grain dose of calomel should then be given, which may be followed in six hours by a tablespoonful of Rochelle salt in a glass of water, or in place of the calomel two compound cathartic pills may be given. If vomiting occur, a large mustard plaster should be placed over the region of the stomach and small pieces of ice in the patient's mouth.

The diet in yellow fever is very important. For the first day or two very little if any food should be given. A little milk diluted with vichy water may be allowed every three hours. Later a little broth and very gradually, when the fever is reduced, other light and easily digestible articles may be allowed in small quantities at regular intervals.

If the fever is high and the patient is restless, 10 grains of aspirin may afford relief, and, if necessary, a second dose may be given after an interval of three hours. Vichy or other alkaline mineral water should be given in small quantities frequently repeated. The bowels should then be kept open by means of rectal injections of warm, soapy water. A long tube attached to the syringe should be passed into the bowels as far as possible and at least a quart injected once or twice a day.

BREAK-BONE FEVER (DENGUE).

This disease occurs during the summer and autumn in the southern part of the United States and throughout the year in tropical countries. It is believed that it is conveyed by mosquitoes, especially those belonging to the species *Culex fatigans*.

Symptoms.—It begins with a slight chill, accompanied by fever and severe pains in the bones, muscles, and joints. There is a red

flush on the skin. These symptoms last for two or three days and the temperature then goes down and the patient has a profuse sweat. The patient feels sore, but greatly relieved. After several days another paroxysm occurs, but the second is much milder than the first. The eruption that appears upon the skin varies in intensity and character, but it often resembles measles, begins on the hands and legs and extends thence to the body. The disease leaves the patient in a weak condition, and convalescence is protracted.

Prevention.—Prevention consists in protecting oneself as far as possible from the bites of mosquitoes. (See p. 56.)

Treatment.—Ten grains of aspirin may be given to the patient and repeated if necessary. Morphine (one-fourth of a grain) may be required if the pains are severe. The patient should be kept in bed while the fever lasts and be given a generous diet of milk, soup, eggs, and gruels. During convalescence plenty of meat, bread, vegetables, and fruit should be eaten to enable the patient to regain his strength.

SPOTTED FEVER (CEREBRO SPINAL MENINGITIS).

This disease is caused by a germ which produces inflammation of the membranes covering the brain and spinal cord. It is thought to be communicated principally through carriers, that is, persons who are not ill or only slightly so but who have germs of the disease in their nose and throat. The disease prevails principally among children and young adults, especially in cold climates during the winter and spring, and is more likely to attack those living in ill ventilated, overcrowded houses. Some epidemics have occurred exclusively in villages.

Symptoms.—The disease begins with a convulsion or a chill, followed by pains in the muscles, severe headache, fever, rapid pulse, and increased respiration. Vomiting is nearly always associated with these symptoms. Delirium usually appears early. The muscles may be contracted so that the legs can not be extended, the neck is stiff, and the back rigid. The pains are often so severe that the patient cries out. This is especially the case if he is disturbed by a noise, if the bed is jarred, or if an attempt is made to turn him or move him. The eruption from which the disease takes its name, "spotted fever," consists of small, round purplish spots either scattered over the whole body or limited to certain areas. It is caused by hemorrhages under the skin and is not always present.

Prevention.—Persons suffering from this disease should be isolated. The nose and throat of the patient and of all persons who come in contact with him should be sprayed with a chlorazene solution (18 grains of chlorazene to 1 pint of water) or a menthol solution (menthol, 5 grains; liquor petrolatum, 1 ounce). If the

disease is prevalent, it is well for all persons to use this spray, as they may be carriers and convey the disease to others, especially to children and young adults. The bowel discharges, urine, and sputum should be disinfected with a solution of bleaching powder made by adding 1 pound of bleaching powder to 4 gallons of water. Equal parts of the solution and the substance that is to be disinfected should be used. The mixture should be allowed to stand at least one-half hour before emptying. The person caring for the patient should not be permitted to mingle with other people and should be careful to wash his hands with the bleaching-powder solution or with a bichloride solution, 1 to 2,000 (see p. 104), whenever he handles the patient. All towels, sheets, and other clothes used about the patient should be boiled or disinfected with the bleaching-powder solution.

Treatment.—The patient should be kept in a darkened room, as far as possible away from noise. Aspirin (10 grains) should be given as required to relieve pain. If morphine is combined with hyoscine, a smaller amount is required; the dose of each in this case would be morphine, one-eighth of a grain; hyoscine, one two-hundredths of a grain. It is important to obtain the services of a physician early, if it is possible to do so, in order that a lumbar puncture may be made with a hollow needle, the excess fluid drawn off, and a curative serum injected. The earlier the serum is used the more likely will it prove beneficial.

CHOLERA (EPIDEMIC CHOLERA, ASIATIC CHOLERA).

Cholera is an infectious disease caused by a specific organism discovered in 1884 by Koch, of Berlin, Germany, and named *Comma bacillus*, because its shape as seen under the microscope is not unlike that of a comma.

Cholera is not endemic in any part of the word except Asia. Its home is in India, where in certain localities it has been endemic probably for centuries.

Every epidemic of cholera is probably due to a spread of the disease, directly or indirectly from its home in India. It is apt to be developed in the wake of moving masses of human beings. It follows the great lines of travel to different parts of the world. It is spread through the agency of the dejections from cholera patients, which contain the comma bacilli. The disease may also be transmitted by persons known as carriers who have the comma bacilli in their intestines but are not sick with the disease. This is one of the chief means by which the disease is spread, as these carriers may have the bacilli of cholera in their stools for many weeks and thus convey the disease to many persons with whom they come in contact.

The comma bacilli find their way into the water supply or become attached to different articles of food and are then in turn introduced through the mouth into the bodies of healthy persons. They may be conveyed in soiled clothing or in merchandise of different kinds. A ship with infection on board may carry the disease from one end of the world to the other.

An attack of cholera may be of any degree of severity. The symptoms usually begin after a period of incubation of from two to five days. The mildest forms are called choleriac diarrhea. The stools are watery, rather large, and of yellowish color, and, in the absence of other symptoms of true cholera, may be mistaken for ordinary diarrhea; or the attack may begin with colicky pains, purging, and vomiting, as in cholera morbus.

All such symptoms occurring in persons who have been ashore at infected ports or who have drunk water taken at such ports should be regarded as extremely suspicious. Under ordinary circumstances it is difficult to distinguish between severe cases of cholera morbus and genuine cholera. Cholera morbus is usually due to indigestible food or other irritating exciting cause, and, while true cholera is not due to such a cause, persons with weak or irritable stomachs are more apt to be attacked by cholera than are healthy persons.

Cholera begins with looseness of the bowels or an apparently simple diarrhea. After a day or two or within an hour or two the diarrhea may become very violent. The evacuations soon lose their yellowish color and assume the grayish-white appearance known as "rice-water stools." Severe cramps occur in the feet and calves of the legs, and sometimes in the hands and arms. Vomiting soon follows. There is a burning sensation in the stomach and the thirst is unquenchable. The urine is suppressed. Large quantities of fluid may gush from the mouth as well as from the rectum; the patient sinks into a condition of collapse. The skin is cold and covered with a clammy sweat. The tongue is coated and cold to the touch, the voice is faint and husky, the breath icy. The whole body shrinks. The temperature in the mouth may fall from 5° to 10° below normal, while in the rectum it may rise several degrees above normal. The intellect usually remains clear until near the end.

In the serious forms of cholera the patient falls into collapse and dies within an hour from the beginning of the attack.

In the milder forms, or if the patient survives the collapse of the severe forms, the symptoms gradually subside, the skin becomes warm, the pulse stronger, urine is again passed, the stools become more natural, and the patient recovers. But there may be a relapse or a low type of fever, called cholera-typhoid, may develop and prove fatal within a few days.

Prevention.—During the prevalence of an epidemic of cholera or while in the vicinity of ports on the Indian coast where the disease is epidemic, every case of mild diarrhea, looseness of the bowels, or irritable stomach should receive most careful attention, for the reason that, as already stated, cholera often begins with such symptoms, and if the infection is brought on board, the men with bowel or stomach trouble of any kind are usually the first victims of the dread disease. No fruits or raw vegetables should be eaten. The drinking water must be boiled. The patient should be carefully isolated and everything brought into contact with him or contaminated by his excretions must be disinfected. The person who waits on the patient should be careful to wash his hands in a solution of bichloride of mercury, 1 to 2,000, whenever they become soiled or before eating his meals. The hands should never be carried to the mouth unless they have been disinfected. It is well for the nurse to wear rubber gloves if they can be obtained. The stools should be passed into a chamber containing a solution of carbolic acid, compound cresol, or bleaching powder. (See p. 104.) The linen and bedclothes should be disinfected by one of these solutions or by dry heat, steam (212° F.), or boiling. The spoons, knives, plates, and utensils of any kind should be boiled immediately after they are used. Flies must be kept out of the compartment.

A ship with cholera on board should go to the nearest quarantine station, not only for treatment of the sick, but also for examination of the well, and above all for the disinfection of the ship, so as to prevent further spread of the disease.

Treatment.—In the first stages of true cholera the treatment is about the same as for cholera morbus, already described. Opium (laudanum), morphine are the remedies chiefly to be relied upon. The patient should be encouraged to drink large quantities of water, to each quart of which has been added 1 teaspoonful of bicarbonate of soda. Hot coffee and tea are valuable in the stage of collapse. They may be injected into the rectum if the patient can not retain them in the stomach. Warm water containing 1 teaspoonful of salt and 1 teaspoonful of carbonate of soda to the quart should be injected into the rectum through a long soft-rubber tube or large catheter attached to a Davidson or, preferably, a fountain syringe. One or two quarts may be introduced slowly. The patient should be wrapped in warm blankets and have hot-water bags, hot bottles, or hot bricks placed to his extremities and alongside his body (careful, of course, not to have them too hot lest great harm be done by burning the skin).

THE PLAGUE.

Plague, one of the most dangerous of all infectious diseases, is caused by a specific microorganism (the bacillus pestis) discovered in 1894 by Kitasato, a Japan physician.

The disease is commonly called bubonic plague for the reason that in the large majority of cases buboes (inflamed and enlarged lymphatic glands) form in the groins. But there is another and more fatal form of the disease, known as septicemic plague, in which buboes are not apparent. Cases of this form run such a rapid course that the patient dies of septicemia (blood poisoning) before the buboes appear.

There is also a dangerous and fatal form of the disease recognized as pneumonia plague. This form begins like pneumonia; the sputum is bloody and contains multitudes of the bacilli.

Buboes occur in about 75 per cent of all cases, chiefly in the groin, but also in the armpit and neck and occasionally about the elbow and the knee joint. They are usually developed by the third or fourth day, sometimes within the first 24 hours; occasionally as late as the second week. They vary in size from a marble to a goose egg, and as a rule are very painful. Sometimes, after attaining a considerable size, the buboes are absorbed; more frequently they suppurate and break. Small boils or abscesses may form on different parts of the body. In some cases dark-colored spots (petechia) from slight hemorrhages form in or beneath the skin. Hemorrhages may also occur from the nose or mouth or from any mucous membrane.

The bacilli are found in the buboes, blood, and internal organs. They enter the body through the respiratory tract, or by way of abrasions or small injuries of the skin. Rats are the chief carriers of the disease from house to house or from dock to ship. The infection is spread from rat to man by fleas. (See p. 58.) Most epidemics of human plague are preceded by wholesale deaths among rats. When the disease attacks the lungs of man it is communicable to others by sneezing and coughing.

Symptoms.—The incubation period of plague varies from 2 to 12 days. Occasionally the onset of the disease is preceded by prodromal symptoms lasting from 12 to 36 hours, characterized by chilliness. headache, nausea, congestion of the eyes, nosebleed, giddiness, an anxious and painful expression of the face, mental depression, and sometimes dull pain in the groin and armpits. In most cases, however, bubonic plague begins suddenly with fever, which may or may not be preceded by a chill. The temperature rises rapidly and reaches its highest point, 105° or 106° F. (40.5° to 41.1° C.) on the second or third day. The pulse, at first full, rapidly becomes small and weak, and the beats vary from 100 to 150 or more per

FIG. 119.—Side view showing mosquito bar properly tucked in.

FIG. 120.—End view showing mosquito bar properly hung and tucked in.

FIG. 122.—Cholera bacilli, mucous flake preparation.

FIG. 123.—Plague bubo in axilla.

FIG. 124.—A 16-year-old victim of hookworm disease.

FIG. 125.—The same girl after treatment for hookworm.

minute. The tongue, at first moist and red or white coated, soon becomes dry and brown, and dark-colored crusts (sordes) may form on the teeth, lips, and nostrils. Delirium or coma is apt to set in. Prostration is extreme, and the patient may die in this early stage before the bubo attains any considerable size, or, as in the septicemic form of the disease, without the appearance of the bubo at all.

In some cases on the third or fourth day the temperature drops a degree or two, but generally rises again until about the fifth or sixth day, when it suddenly drops to normal or subnormal. Death may or may not take place in this stage. More frequently there is a sudden rise in the temperature immediately preceding death, and in favorable cases the temperature falls to the normal gradually.

About 70 per cent of all cases die within the first six days. Survival of the sixth day may therefore be regarded as a hopeful sign. In cases which tend to recovery the symptoms improve gradually. Convalescense is slow, and at the seat of the bubo an indolent sore may be left, which is very slow to heal.

Prevention.—The patient should be immediately isolated in a clean and well-ventilated compartment, and all parts of the house or ship should be thoroughly fumigated with sulphur to kill rats and fleas. (See p. 65.) The discharges from the patient—urine, feces, vomit, or sputum—should be passed into bowls or pots containing a solution of carbolic acid, compound cresol, or bleaching powder. (See p. 104.)

The person detailed to wait on the patient should be free from sores or scratches of any kind, and should exercise the most scrupulous care of his hands, and all articles brought into contact with the patient should be disinfected. (See p. 104.) In pneumonic plague the nurse should wear a mask to protect himself from inhaling the plague bacillus when the patient coughs or sneezes.

A ship with plague on board should be taken to the nearest quarantine for necessary treatment, and to give the survivors the best chance for life.

Treatment.—Constipation should be relieved by calomel, 5 grains, followed in five hours by a dose of Rochelle or Epsom salt. The food should be concentrated and nourishing. If diarrhea is persistent, it may be relieved by salol in 5-grain doses, given every three hours.

Ice or cold water should be applied to the aching head and the hot body sponged with cold or tepid water. In the earlier stage of the buboes the local application of ice is useful. Later on, if softened, they should be incised and dressed with iodoform gauze. Pain and restlessness may be relieved by morphine, one-sixth grain, repeated in two hours if necessary.

BERIBERI (THE KAKKE OF JAPAN).

Beriberi is a form of multiple-neuritis (inflammation of nerves), characterized by numbness, tenderness, and edema (dropsical swelling) of the legs and other parts of the body; by irritability of the heart, extreme weakness, and paralysis. It is a disease which occurs mostly in tropical climates, but is frequently carried by ships into temperate latitudes. A warm climate, however, is not necessary to develop the disease, as a number of years ago it was present among Gloucester fishermen. A diet of polished rice may produce the disease. (See p. 75.) Cases are often found where a one-sided diet is supplied. Four forms of the disease are recognized:

(1) The mild or rudimentary form begins with a feeling of weakness and numbness of the extremities, with edema of the skin and tenderness of the muscles, especially of the calves, uneasiness in the belly, shortness of breath, and palpitation of the heart. These symptoms may last only a few days or several weeks and then disappear, but recurrences are common.

(2) In the dry or atrophic form there is no edema, but the other symptoms are marked and more rapidly develop. Instead of edema and puffiness there is atrophy of the parts. The tendon reflexes are lost. The muscles of the legs and arms and sometimes of the face are paralyzed and painful. All the muscles of the body waste away. The patient presents a pitiful, shrunken appearance, suffers intense pain, is sensitive to the slightest touch, and may die from general exhaustion or, after lingering many months, gradually improve and get well.

(3) The wet or dropsical form begins with symptoms similar to those of the mild form, but the edema soon extends over the entire body, watery effusions into the serous sacs take place; there is marked shortness of breath, frequently nausea and vomiting, and always weakness of the heart. Death may occur from heart failure or from paralysis of respiration. On the other hand, the dropsy may gradually or rapidly disappear and leave the patient in essentially the same condition as that described under the head of the dry or atrophic form.

(4) The most serious or dangerous form of beriberi is called the acute pernicious cardiac form. In this the general symptoms of the disease may be only slightly developed, but the cardiac (heart) symptoms are marked. The disease in this form usually lasts several days or weeks, but death may occur from heart failure within 24 hours from the onset.

Prevention and treatment.—The diet should be immediately changed. Wheat flour and oatmeal should be substituted for rice. Fresh meat and vegetables should be supplied if they can be obtained;

onions, dried beans, and peas should be eaten; potatoes should be cooked in their jackets; as few canned goods as possible should be taken. When a vessel is being fitted out for a long voyage care should be exercised to provide food which contains ingredients necessary to health. A man who is ill with the disease should be relieved of duty and kept in bed, as there is danger of heart failure if he is permitted to exert himself in any way.

SCURVY.

Scurvy is a disease produced by improper or unsuitable food. Many years ago it was of frequent occurrence among seafaring men on long voyages. Now it is a comparatively rare disease, thanks to better provisions and better methods in issuing food supplies.

Symptoms.—Swelling, sponginess, and bleeding of the gums. The teeth become loose and frequently drop out. The breath is foul, the tongue swollen. The skin becomes dry and scaly. Hemorrhages (small dark red spots) occur under the skin, first on the legs and then on the arms and other parts of the body. Bleeding from the nose frequently occurs. Swelling about the ankles is common. The skin of the legs is frequently discolored in large blotches, and there is often a peculiar hardness or induration of the muscles of the calf of the leg. The complexion is frequently of greenish or dirty-yellow hue. The pulse is rapid and weak. There may or may not be slight fever. The bowels may be constipated or there may be a troublesome diarrhea.

In severe cases debility and emaciation are quite marked. The mind wanders, and occasionally there is wild delirium.

Prevention and treatment.—This consists almost wholly in a change of diet. Give fresh vegetables, fresh milk, fresh beef, oranges, lemons, limes, or lime juice. Begin with small quantities at short intervals, and increase the allowance as rapidly as the stomach can take care of it. Pickles, onions, sauerkraut, raw potatoes, and raw cabbage are valuable articles in the make-up of a varied diet.

Potassium chlorate dissolved in water should be used as a mouth wash, and the gums should be frequently painted with tincture of myrrh. The skin should be kept in good condition by frequent bathing. The sleeping quarters should be clean and well ventilated.

TAPEWORMS.

A tapeworm consists of a head, neck, and a ribbon-like trunk made up of segments. As it grows new segments are formed while the hindmost segments, containing the eggs, are thrown off. If the cast-off segments are eaten by animals the eggs develop into embryos

which bore through the intestinal wall of the animal, enter the blood stream and become lodged in its tissues. Here each embryo is surrounded by a capsule, and if the meat of the animal is eaten by a human being the capsule is digested and the worm is set free. It attaches itself to the intestinal wall and it again begins to develop into an adult worm.

Beef tapeworm (*Tænia saginata*).—This is the commonest of the large tapeworms and occurs in man after eating raw or uncooked beef containing the embryo. Beef tongues are especially liable to be infected. The head of the worm is small and hardly visible to the naked eye. Under the microscope the head is seen to have four suckers by which it attaches itself to the intestinal wall. This worm sometimes reaches a length of 30 feet, and is often one-third of an inch broad as its thickest part. The segments vary from 18 to 30 in number.

Pork tapeworm (*Tænia solium*).—This tapeworm is not as common as the beef tapeworm. It develops in the small intestines after eating raw or underdone "measly" pork, and ranges from 6 to 13 feet in length. The head, besides 4 suckers, has a circle of 26 long and short hooks by which the worm holds on to the lining membrane of the bowel.

Symptoms.—Tapeworms may develop in man at any time of life. They do not cause symptoms until about three months after the infected meat has been swallowed. It is a popular idea that tapeworms cause many symptoms, but the disturbances caused by the worms are limited to the abdomen. The infected persons usually have voracious appetites, and they are liable to attacks of constipation alternating with diarrhea, pains in the abdomen, indigestion, nausea, and vomiting. The presence of a tapeworm is known by the passage of the segments, which may be seen in the stools, or found in the bed or clothes of the patient.

Prevention.—Care should be taken not to eat undercooked beef or pork. Cattle and hogs should not be allowed to drink water which has been contaminated with discharges from privies or water-closets, as this water may contain tapeworm eggs from the human body. Animals who drink this water may become infected, and the tapeworm may then be transmitted to persons who eat the meat of these animals. For this reason a tapeworm that has been discharged by a person should be burned and should not be thrown out where it can be eaten by animals.

Treatment.—Treatment consists first in starving the tapeworm, and then dislodging it by medicines which make it let go its hold upon the lining membrane of the intestine. The patient should not eat anything except a light diet of milk and soup for two days prior

to taking the medicine and nothing should be eaten the evening of the day before the drug is taken. There should be no breakfast in the morning, and the medicine should be taken about 10 o'clock. Various curative substances are used, the best probably being a fresh preparation of the extract of male fern. The dose for an adult is one-half to 1 dram. It should be given in capsules and should be followed in a few hours by a dose of salts. If there is pain and the bowels do not move easily, an injection of warm water is administered. Instead of male fern, a decoction of pomegranate bark may be used. This is made by adding 4 ounces of pomegranate bark to a quart of water. This mixture should be allowed to stand for 24 hours and then boiled until it is reduced to 5 ounces. The whole amount of the pomegranate bark should be taken in three or four doses at short intervals. Pumpkin seed mashed up and made into a paste with sugar is also a useful remedy. The seeds should be deprived of their envelopes. About 4 tablespoonfuls should be taken.

ROUNDWORMS.

Roundworm (Ascaris lumbricoides).

This worm is of a yellowish or reddish brown color and measures from 7 to 14 inches in length. It is about the diameter of a goose quill. There may be only a single worm or several may inhabit the intestines. The eggs gain entrance into the human body through drinking water and food.

Symptoms.—They may not cause any symptoms and their presence may only become known when they are passed in the bowels. They may, however, give rise to pain in the abdomen, and cause diarrhea and loss of appetite. Occasionally a worm will pass up into the stomach, where it will cause nausea and vomiting, or will enter the bile duct, and produce jaundice. If the worms are present in large numbers, the bowels may be obstructed, with accompanying serious symptoms.

Prevention.—All worms should be burned immediately after they are passed from the body so that their eggs can not get into water used for drinking purposes. The fact that these worms may infect the human body through drinking water should be remembered so that care may be taken to obtain only water from the purest sources or that which has been passed through a purifying plant.

Treatment.—A light diet should be taken while medicine is being administered. Santonin is efficient, given in doses of one-fourth to 1 grain to a child and 2 to 4 grains to an adult. This dose should be given twice a day for several days and should be followed by a purgative, such as 1 or 2 grains of calomel.

Seatworm (Oxyuris vermicularis).

This is a small worm of a whitish color, being from one-sixth to one-half inch long. It is found mostly in the lower portion of the bowel where it causes intense itching when it crawls out through the opening.

Symptoms.—The itching is worse at night. The skin may become inflamed and reddened through scratching to relieve the itching and considerable pain of a burning or bearing down character may be present. The condition may seriously interfere with sleep. Inspection of the stools will show the presence of the white threadlike parasites.

Prevention.—Persons become infected by swallowing eggs that may be present in drinking water or upon uncooked food and fruit that has come in contact with the hands of infected persons. The eggs may be embedded under the nails of ignorant and unclean persons who may infect themselves and other persons.

Treatment.—A purgative should be taken to drive the parasite into the lower bowel, and after this acts an injection consisting of a decoction of quassia bark should be given into the rectum. This decoction is made by boiling 1 or 2 ounces of the bark in a pint of water. The underclothes should be changed and boiled and the person's skin should be washed with a solution of carbolic acid prepared by dissolving half a teaspoonful of carbolic acid in a pint of boiling water.

Hookworm (Nercator americanus).

Hookworm disease is due to small, round worms which attach themselves to the lining membrane of the intestine, suck the blood, and cause the condition of anemia and emaciation which are such marked features of the complaint. The disease is due to a poison produced by the worm.

The life history of the worm is described by Stiles as follows:

LIFE HISTORY.—The adult hookworms live in the small intestine, occasionally in the stomach. They mate in the bowels, and the females deposit numerous eggs. The eggs do not, however, undergo full development until they are discharged with the fecal material from the host. Thus every individual hookworm found in the intestine represents infection with a separate germ.

FREE LIFE.—After a short time (eight hours to several days), the period varying according to conditions of heat and moisture, a tiny embryo develops in each egg. This embryo breaks through the eggshell and feeds on the ground or in the night soil. In the course of two days or so the embryo sheds its skin, but continues to feed. After about a week the worm sheds its skin again, but continues to live inside of its discarded skin, and it no longer takes any food. During this development, the rapidity of which may vary according to circumstances, the worm undergoes a growth in addition to certain changes in structure. The worm which lives in its second cast-off skin represents the

FIG. 126.—Greatly enlarged view of a hookworm shortly after it has hatched from the egg. (Original.)

FIG. 127.—Figure of a worm about 7 days old. This is the so-called "encysted stage" and is the stage which enters man. (Original.)

FIG. 128.—Chancre of lip. Bank clerk; possibly received from dirty bills.

FIG. 129.—Chancre of upper lip. Possibly received from common drinking cup.

FIG. 130.—Chancre, lower lip. Inoculation by kissing.

FIG. 131.—Chancre of cheek. Inoculation by barber.

infecting stage which enters man and is sometimes called the "encysted stage." It may live in this condition for five months, perhaps longer.

MODE OF INFECTION.—Infection may occur in two different ways, namely, per mouth or per skin.

Mouth infection.—Formerly infection by mouth was supposed to be the only method by which the worms entered the human body. Then when the method of skin infection became known opinion went to another extreme, and there was a tendency to ignore or minimize the mouth infection. Opinion is now moving back again in the other direction, and indications are accumulating to support the view that infection by mouth is by no means rare or exceptional.

Skin infection.—If in the infecting stage it gets upon the skin, either of persons who go barefooted or who handle infected dirt, the worm bores its way into the pores, as into hair follicles, and escapes from its surrounding sheathlike skin. It then starts on its passage through the body. It may enter the blood, pass through the heart, filter out in the lungs, crawl up the trachea, down the esophagus, through the stomach, and find its way to the small intestine. In laboratory experiments on animals the worms may be found in the intestine 8 to 14 days (possibly earlier) after the skin infection has been practiced. Arriving in the intestine. the worm sheds its skin two more times, becomes adult and mates, and Looss has proved in the case of the Old World hookworm that eggs may be found in the stools 71 days after infection.

Claude Smith found eggs in the feces six and one-half weeks and seven weeks after experimental skin infection on two persons with the American parasite.

Symptoms.—While the worms are working their way through the skin, an intense itching is produced, which is called "ground itch." Small vesicles occur at the point of entrance, the skin becomes reddened and is usually covered with scratch marks, due to the patient's effort to relieve the itching. This is the first stage of the disease. Later, when the worms reach the intestinal tract, the patient becomes pale and thin. Children are undersized, with large bellies; they are stupid and backward in their lessons at school. Their appetite is perverted, patients often eating clay, plaster, cotton, and other indigestible substances; there is pain and tenderness in the abdomen; constipation is common; stools are clay colored and may be streaked with blood. The afflicted person tires easily and gets out of breath from slight exertion. Dizziness and headache are not unusual symptoms.

Prevention.—Hookworm disease is a disease of rural communities. It is prevented by providing a safe means for the disposal of human excreta. (See p. 39.) The habit of going barefoot in warm climates greatly increases the liability of contracting infection. The treatment consists mainly of the administration of thymol, but this should only be taken under the direction of a physician.

SYPHILIS.

Syphilis is a constitutional disease, caused by a microorganism called *Spirochætæ pallida.* It is communicable and is usually acquired during sexual contact. It may, however, be contracted in many different ways, direct and indirect. It begins by a primary

lesion or sore, called a chancre, at the seat of inoculation (where the virus enters), and is followed by eruptions of the skin of different forms and different degrees of severity and variable duration. Sores also appear at the angle of the mouth and *mucous patches* develop on the lips, tongue, inner sides of the cheeks, and sore throat is often present. *Mucous patches* or *syphilitic warts* are also frequently seen about the anus or in any region where the skin is moist. The hair frequently falls out, the eyes are sometimes seriously involved, and sooner or later every organ in the body may become affected.

The primary or initial lesion of syphilis (the hard chancre) usually appears about 3 weeks after exposure, but may be as early as 10 or 12 days or as late as 5 or 6 weeks. It begins as a red spot or papule, which usually breaks and forms a small ulcer with hard edges. Sometimes the sore appears as a simple excoriation or superficial ulcer without hard edges. The neighboring glands become in the course of a week or two enlarged and hard. They seldom suppurate. About two months later the skin eruption and other secondary symptoms begin. The lymph glands above the elbow, along the side and back of neck, and all over the body are usually enlarged. Patient frequently complains of headache and pain in the limbs, always worse at night, and may have slight, occasionally considerable, fever.

Prevention.—A man suffering from syphilis in an active form should be compelled to use separate drinking cups, knives, spoons, forks, towels, etc. These articles should be disinfected by boiling or by one of the solutions described on page 104. He should under no circumstances smoke the pipe belonging to another man or allow another man to smoke his. He should sleep in a separate bed and all his belongings should be kept strictly to himself, for unless the greatest care is taken other persons may contract the disease from him. Chancre of the lip may be acquired by smoking the pipe of a syphilitic. No one suffering from syphilis should kiss or fondle another person, as he is liable to convey the disease to that person.

Treatment.—For the primary sore bathe the part with soap and water and dust boric acid over it twice a day.

If secondary symptoms, eruptions of skin, etc., appear, give a pill of protiodide of mercury, one-sixth grain, three times a day. Salvarsan, diarsonal, or some other similar arsenical preparation is the best remedy for the disease, but this medicine can only be given by a physician. The mouth and teeth should be kept clean by means of a soft toothbrush and Castile soap and water, or water to which a small quantity of bicarbonate of soda (baking soda) or tincture of myrrh has been added. If mucous patches appear in the mouth, smoking must not be allowed. After dressing a syphilitic sore, a person should wash his hands carefully with soap and water and then in a disinfecting solution. (See p. 185.)

SOFT CHANCRE (CHANCROID).

Soft chancre or chancroid is a virulent ulcer. It usually begins within 36 hours after exposure, first as a red spot, but rapidly develops into an ulcer covered with thick yellowish pus. The period of development is about three or four days. Sometimes a week elapses from the time of exposure to the development of the sore, and occasionally the period of incubation is as long as 10 days. A sore appearing within a few days or a week or even as late as 10 days after exposure is usually regarded as a chancroid; but in practice this is not a safe rule, for the reason that many venereal sores are of a mixed character. The inoculations of both poisons may take place at the one and the same spot—the result is a mixed chancre; or if two sores appear, the origin of one may be syphilitic, the other chancroidal. It is therefore difficult, if not impossible, in many cases to determine the character of the disease from the period of incubation or from the appearance or local characteristics of the sore. A mixed chancre is a syphilitic chancre (a hard chancre), while its appearance may be precisely like that of the soft chancre or chancroid. The only safe plan is to regard all venereal sores as suspicious until a microscopical examination can be made to determine if the *Spirochætæ pallida*, the organism of syphilis, is present. The mixed chancre, as already stated, is essentially a syphilitic chancre, and the beginning of constitutional disease. Its local effects, however, may be precisely the same as those of soft chancre or chancroid. The ulcer or ulcers (sometimes there are two or more) may remain as small as a pea or grow as large as a quarter, and if it becomes phagedenic (eating) may spread over a large surface of the body. It is also proper to state that a secondary syphilitic sore may appear under the foreskin, as well as at any other place on the body, and that cancer (epithelioma) of the organ may begin as a small ulcer. The latter, however, is a rare disease as compared with the different varieties of chancre.

The most frequent complications of soft chancre or chancroid is inflammation of the lymph glands of the groin (bubo), known to the sailor as "blue balls." Another troublesome and serious complication is the elongation and contraction of the orifice of the foreskin (phimosis), on the inner surface of which the sores may be located. The swelling and tension may be so great as to produce gangrene (mortification). If the foreskin is very tight and pulled back and can not be brought forward again, the condition is known as paraphimosis, which produces great swelling, the same as if a string were tied around the organ, frequently resulting in severe ulceration and destruction of tissue. This condition may also be

the result if the inflammation and swelling are marked and the foreskin very tight.

Treatment.—The sore should be dried and covered with a small piece of aseptic gauze or absorbent cotton, and later a dusting powder of boric acid may be applied.

If phimosis exists, the cavity of the foreskin should be syringed out with hot water, and if there are sores under the foreskin which can not be reached by the boric acid the cavity should be syringed with a solution of one-half teaspoonful of carbolic acid to one-half pint of hot water. Soft chancres or chancroids appearing at the anus or rectum should be treated by frequent washings of warm water and the application of calomel.

In all cases, wherever the sore is located, cleanliness must be insisted upon, and, as already stated, in nearly all inflammations of whatever character hot water alone is a valuable remedy, and rest in bed is of equal importance. If a lump (bubo) appears in the groin, rest in bed is of the greatest importance. The diet should be light but nourishing. Tincture of iodine, pure or diluted one-half with alcohol, may be painted over the lump, but it is not of much value. Rest is the important thing. If the bubo goes on to suppuration, it should be carefully opened with the point of a sterilized knife (see p. 176) and kept open by a strand of aseptic gauze, which must be frequently changed, and enough aseptic gauze should be placed on top of the wound to absorb the discharges. The soiled gauze should be burned, and the person handling it must be careful to wash his hands in soap and water and in a disinfecting solution. (See p. 217.) The patient's bowels should be moved once a day.

GONORRHEA (CLAP).

Gonorrhea is a specific inflammation of the urethra due to a microorganism called gonococcus. It usually begins during the first week after exposure, sometimes as early as 3 or 4 days, and occasionally as late as 10 days or 2 weeks. The first symptoms are a tickling or itching sensation and a slight swelling about the lips of the orifice of the urethra. A purulent creamy-colored discharge soon appears, and a burning or stinging pain attends the passage of urine. The inflammation gradually extends to the deeper parts of the urethra, and, unless checked by medication, reaches its height about the end of the second or during the third week. The patient may experience great difficulty in passing water. If the inflammation runs very high, abscesses may form in the tissues around the urethra, and swelled testicle and bubo are frequent complications, also painful erections and bending of the organ (chordee). Phimosis or paraphimosis occurs if the foreskin is tight or becomes involved in the inflammation.

If phimosis occurs, and if the cavity of the foreskin is not thoroughly and frequently washed out, "venereal warts" are apt to form.

True gonorrhea, if carefully treated, gradually subsides and recovery may take place in from four weeks to two months. A urethral discharge that recovers in a few days or a week is probably a simple urethritis.

Gonorrhea is urethritis (inflammation of the urethra), but urethritis is not necessarily gonorrhea.

Prevention.—This disease is not as serious an affection for men as for women. In man it may in time cause a stricture of the urethra, which, if neglected, may be followed by retention of urine and disease of the kidneys, or sterility may result if both of the spermatic ducts become permanently closed. These sequelæ are, however, rare, and men usually get well without permanent injury, but it often takes a long time to cure them. The acute symptoms generally subside within a few weeks, but a slight discharge may be present for months or years. This discharge may be noticed only occasionally, as after drinking beer or severe muscular exertion. No man should ever marry as long as this discharge is present and until he is pronounced cured after a careful examination by a competent physician, as he may convey the disease to his wife.

Gonorrhea in women is a very serious complaint, as the gonococcus is liable to travel up into the womb and extend from there to the ovaries and peritoneum (the serous membrane lining the abdominal cavity). It often produces a severe inflammation of these structures, resulting in the formation of abscesses and adhesions which bind the organs together in one mass. This causes sterility and invalidism, due to constant suffering. Most of the operations performed on the reproductive organs of women are for the relief of conditions following gonorrhea.

Treatment.—Rest in bed, light diet, plenty of water to drink, regularity in eating and sleeping. Keep the bowels open by taking a moderate dose of Epsom salt in the morning. Avoid strong coffee and tea, all stimulants, and greasy articles of food. Keep the body and mind at rest. Bathe frequently in hot water. Be very careful not to carry any of the pus from the urethra to the eyes. (Gonorrheal inflammation of the eyes is a serious disease, which not infrequently results in total blindness.)

Injections of silvol 5 parts, water 90 parts; argyrol, 10 per cent solution; permanganate of potash 1 part, water 5,000 parts; or sulphate of zinc 1 grain, water 1 ounce, into the urinary canal may be used. They should be employed as follows: The patient first passes his water, the urinary canal is then washed out with several syringes full of warm water. One of the above solutions is then injected slowly into the canal and held there five minutes by the watch. The

best syringe for this purpose is one made of glass, having a plunger wrapped with cotton thread. If a testicle swells, apply cloths wrung out of cold water, or an ice bag. Rub the affected part with the following mixture: Oil of wintergreen (10 drops) and olive oil (1 teaspoonful). The treatment of bubo is described on page 142. If chordee is troublesome, apply cloths wrung out of cold water.

STRICTURE OF THE URETHRA.

True or organic stricture of the urethra is a narrowing of the tube. It is commonly the result of long-continued or neglected gonorrhea. Stricture of the urethra may be produced by direct injuries, as kicks or falls on the perineum, or by the use of too strong injections, or by the careless passage of instruments.

Occasionally stricture results from simple urethritis, not gonorrheal, and symptoms not unlike those of stricture are sometimes caused by a stone in the bladder obstructing the passage, and by an enlarged prostate gland.

Gonorrheal stricture of the urethra is usually of slow development. It may be several months or years after the attack of gonorrhea before the patient becomes conscious of any change in the size or shape of the stream. First there may be only a twisting or flattening of the stream. In severe cases it gradually becomes smaller and smaller, until it is no larger than a knitting needle and passed with great difficulty, or it comes away drop by drop, and finally results in complete retention. One of the earliest symptoms of stricture is a gleety discharge from the urethra.

Occasionally retention of the urine is the first symptom of the disease.

Sudden retention may be due to spasm of the urethra (spasmodic stricture).

Spasmodic stricture may occur independently of any specific disease of the urethra, but it is more frequently a complication of organic stricture. Exposure to cold and wet (catching cold), or a debauch, are the usual exciting causes.

When retention occurs the bladder gradually becomes distended and a fullness or distinct tumor may be felt in the lower part of the abdomen, which in severe cases may extend as high as the navel. Sometimes there is an involuntary flow, or an overflow of urine from a distended bladder—a patient says he can not hold his water, and in such case it may be difficult to convince him that he is suffering from retention until a catheter is passed and a quantity of urine is withdrawn.

Treatment.—A neglected stricture of the urethra is a serious disease, the treatment of which is difficult in many cases, even in the hands of the most experienced surgeon.

If a case is allowed to run on until there is an actual stoppage or retention of urine, the consequences are extremely serious, and death may result unless this condition is relieved.

Place the patient on his back with his knees slightly drawn up, and try to pass a catheter. The instrument should first be thoroughly cleansed by placing it in boiling water. It should then be oiled with olive oil, and carefully passed into the urinary passage and an effort made with the greatest gentleness to pass it into the bladder. Try the largest size catheter first; if this fails, try the smaller ones. If a catheter can not be passed at the first trial, place the patient in a hot bath, give him 20 drops of laudanum or one-quarter grain morphic sulphate, and an hour or two later try the catheter again. If it is not practicable to place the patient in a full bath of hot water, then cover his belly and other parts of his body with flannels wrung out of hot water and change them every 15 minutes. The object of the hot bath and the laudanum is to produce relaxation. Sometimes a patient will pass his water in the bath.

COUGHS AND COLDS.

When a person has a cough that lasts more than two or three weeks, even though the symptoms are mild, the case is serious enough to require an examination by a physician, and one should be consulted on the first opportunity.

A case of bronchitis or bad cold usually begins with a cough, sometimes starting with an irritation in the throat, which gradually travels down into the lungs. Though the cough at first is dry, there will be some expectoration later on, especially marked in the morning on first arising. It may at first be white and tenacious, later on becoming yellowish. With this there will be some soreness over the upper and front part of the chest, and if the cough is violent there will be considerable soreness of the muscles between the ribs.

Treatment.—For the soreness over the chest a good rubbing with soap liniment may help to relieve the symptom. A tablet of Brown Mixture or one teaspoonful of Mistura pectoralis (expectorans) N. F. given every three hours is serviceable. The bowels should be kept open by a tablespoonful of Epsom salt, when necessary.

Patients with coughs and colds should not be kept in a hot, dry room without ventilation. Plenty of fresh air should be allowed to come into the room, with the precaution, however, that the patient be not exposed to a draft and that he be properly clothed so as not to become chilled when the weather is cold.

A cold in the head may often be aborted if the patient, when he feels the cold coming on, will take a hot bath or a hot mustard foot

bath, go to bed, drink hot lemonade or hot weak tea, and cover himself up well until a good perspiration is induced. Care should be taken next day to wrap up carefully if he goes out of the house, as otherwise the symptoms may return in greater severity. Aspirin in doses of 5 to 10 grains every three hours may be taken during a cold if there is headache or pain in the limbs. Menthol drops are useful (p. 310).

CROUP.

There are two kinds of croup—true croup, which is the same as diphtheria (described on p. 113), and false croup, which is a nervous affection and occurs in spasms, usually at night.

Prevention.—Local applications of ice water or a cold compress will often prevent attacks. A mild mustard plaster applied to the throat and chest may act in the same way. If a child is especially subject to this condition, it is sometimes best to use steam from the so-called "croup kettle." This is arranged by covering the top of the bed with sheets, which should be raised some distance above the child's head. The steam from the kettle, heated by alcohol, is then conveyed into this space. The steam keeps the air moist and prevents the spasm. Care should be taken the next day to see that the child does not go out of doors and is not exposed to drafts, in order that he may be prevented from catching more cold.

Symptoms.—The attack is preceded by hoarseness and a loud, rough cough, which, from its peculiar sound, has been called a "croupy" cough. The attack comes on usually about midnight. The child is awakened from a sound sleep by coughing and violent efforts to get his breath. The face becomes blue and presents an anxious expression. These symptoms usually cease abruptly in an hour or two and the child resumes its slumber. The attack may be repeated on subsequent nights.

Treatment.—Simple means often have a wonderful effect in relieving a spasm. Sometimes passing the finger down the throat will have this effect. A warm bath may break up an attack. The best method, however, is to give a teaspoonful of tincture of ipecac, followed by a little milk. This causes vomiting and relieves the condition.

BRONCHO-PNEUMONIA.

This is a disease that occurs principally in young children. It differs from lobar pneumonia (described on p. 110) in that it attacks both lungs, whereas lobar pneumonia usually attacks only one lung. Although broncho-pneumonia may affect an entire lobe, it usually confines itself to some of the small endings of the bronchial tubes and the air vesicles in immediate relation thereto. It is due to the same germ—pneumococcus—which causes lobar pneumonia.

Symptoms.—The symptoms are similar to those of a severe bronchitis, which has been described under "Coughs and colds," on page 157. They consist of a loud, harsh cough, accompanied by pain, shortness of breath, and fever. The cough is attended with a glairy and tenacious expectoration, which may be blood tinged. The temperature may rise as high as 104° or 105° F. The shortness of breath is very distressing; the respirations sometimes amount to as high as 60 or 80 per minute. The pulse is frequent and may be rapid, feeble, and irregular. Recovery generally occurs in two or three days, but many cases last for several weeks.

Prevention.—Other children should be kept away from the patient and care should be taken to boil all sheets, pillowcases, and other articles which come immediately in contact with the patient. Separate dishes should be used, and they should be scalded with hot water after being in the sick room. The child's mouth should be carefully wiped with tissue paper, and the paper immediately burned. This condition frequently follows measles, whooping cough, and common colds. Children suffering from these affections should be given careful attention and not be allowed to expose themselves to cold until they have fully recovered; otherwise this form of pneumonia may develop.

Treatment.—The sick room should be well ventilated with the temperature kept at about 70° F. A croup kettle (described on p. 158) should be employed to keep the air around the bed moist. A large mustard plaster may be applied over the chest. This should be made in accordance with instructions given on page 310 and should be allowed to remain on only a sufficient length of time to redden the skin. One grain of calomel should be given in broken doses, one-tenth of a grain every 10 minutes until the whole amount has been administered. The calomel should be followed in a few hours by a Seidletz powder or a small dose of salts. In cases where it is not possible to give the salts on account of the quick breathing of the child, a glycerin suppository may be employed instead. If there is very much pain, a Dover's powder may be given, 3 grains being a dose for a child 5 years of age. This may be repeated several times, but it is not best to give it very often, as it interferes with the discharge of the secretion from the lungs. In some instances, this secretion blocks up the lungs and the child becomes blue. In that case a teaspoonful of sirup of ipecac should be given with a little milk to produce vomiting. Vomiting assists the bronchioles in clearing themselves of the secretion. One of the best expectorants is compound sirup of squills in doses of 4 drops for a child 5 years of age. This may be given every two hours, but if it produces nausea the dose should be reduced.

PLEURISY.

Pleurisy is caused by exposure to cold or wet. In nearly all cases, however, there is an underlying diseased condition present, such as tuberculosis, rheumatism, gout, chronic alcoholism, or heart or kidney disease. It may arise as an extension of inflammation from the lungs and their neighboring organs, being more common with lung fever, the pneumonia of adults, than with bronchial pneumonia, the pneumonia of children. Pleurisy may also follow injury to the chest wall.

Symptoms.—The first sign is a pain in the chest, often called a "stitch in the side," which is worse when breathing rapidly or moving around. There is a dry distressing cough which the patient tries to restrain in order to avoid the pain which it causes. The usual signs of fever, such as an increased pulse rate, hot skin, and flushed face are present. After a day or two there may be an effusion of fluid into the pleural sac. When this occurs pain will be less but the breathing will be more difficult. In favorable cases, this fluid is absorbed in a few weeks and the patient recovers; when this does not occur, the physician has to draw it off through a hollow needle.

Prevention.—The best way to prevent pleurisy is to keep the body as healthy as possible; then it is not so liable to be affected by cold and wet. Every person should live out doors as much as he can and see that there is plenty of fresh air present when he has to remain indoors. During sleeping hours, windows in bedrooms should be kept open. Persons who suffer from gout or rheumatism should be especially careful not to expose themselves to inclement weather.

Treatment.—In order to lessen the pain the patient should be put to bed and the affected side should be strapped with strips of adhesive plaster. This is done by taking 4-inch strips and applying them as tightly as possible from the middle of the chest in front to the center of the back. Other strips are then applied, each one slightly overlapping the one above until five or six of the strips have been placed in position. Cold applied to the side by means of ice or ice water in a rubber bag will often relieve pain. In some cases morphine has to be given in doses of one-sixth to one-fourth of a grain, but this should not be used if it can be avoided and the dose should not be repeated unless the severity of the pain demands it. One-half a teaspoonful of paregoric may be given instead of the morphine.

HEART DISEASE.

Heart disease is a condition which often follows syphilis, diphtheria, scarlet fever, acute rheumatism, chorea, or tonsillitis. It may be caused by the persistent use of alcoholic liquors, or by the absorption

of small quantities of lead, as in the case of house painters, those who use hair dyes or drink water from lead pipes. It may be a part of a general process, known as arteriosclerosis, in which there is a hardening and loss of elasticity of the walls of the arteries, including the arteries which supply the heart muscle.

Symptoms.—The symptoms of heart disease are due to a dilatation of the chambers of the heart caused by the backing up of blood in them; this results from imperfect closure of the heart valves or from weakening of the heart muscle. In some cases thickening of the muscular walls of the heart occurs, which compensates for the enlargement of its cavities, as the extra strength of the heart muscle enables it to force out at each contraction of the heart the additional amount of blood contained in its cavities. In such cases there may be no symptoms, but when the heart muscle begins to fail the symptoms appear. There is shortness of breath, coughing, spitting of blood, indigestion, headache, dizziness, blueness of the skin, dropsy, irritability, delusions, delirium, or melancholia. Besides these symptoms there are special symptoms referable to the organ itself, such as:

Palpitation.—Palpitation means that the heart beats are irregular, rapid in action, and perceptible to the patient. It may be accompanied by shortness of breath. Its chief causes are mental excitement, excessive smoking, dyspepsia, overindulgence in tea, coffee, or alcoholic liquors. It often occurs in young soldiers, athletes, and those whose duties require inordinate muscular exertion.

Breast pang (angina pectoris).—There are two forms of breast pang, one in which the patient is seized with a sudden, violent pain of the heart, attended by a sense of impending death. The face is pale, the skin is covered with a cold sweat, and the breathing is shallow or it may even stop while the pain lasts. This pain radiates over the left shoulder and arm and usually passes off in a few seconds or minutes. The person may die during the attack or the attack may recur after an interval of a few days or not for many years. The other, or mild form of angina pectoris, occurs mostly in nervous persons and is usually due to overexertion or indiscretion is eating. The pain is less intense, but lasts longer and is usually relieved by the eructation of gas from the stomach.

Fainting.—This is caused by anemia of the brain due to inefficient action of the heart or vascular relaxation. During the fainting fit the patient is often unconscious. The spell may be preceded by a short period of vertigo or the patient may complain that everything has turned black before his eyes.

Prevention.—Children should not be allowed to take active exercise after they have had measles, scarlet fever, or diphtheria; after

an attack of acute rheumatism the patient should be kept quiet until all danger of injury to the heart is passed. Those who suffer from infected tonsils should have the latter removed. A dentist should be consulted frequently in order to ascertain if there is any pus around the roots of the teeth. Such pus, if discovered, should be drained to prevent the absorption of poisons which may injure the heart. Alcohol and tobacco should not be indulged in to excess as irregularity of the heart's action often follows their use. Persons who have led sedentary lives should not suddenly take up athletics or engage in occupations which require sustained muscular effort as the heart muscle is liable to be injured thereby. Such a change, if made, should be a gradual one in order that the heart may accommodate itself to the extra work required of it.

Treatment.—Special care should be taken not to eat indigestible articles, as gas produced in the stomach and intestines by the fermentation of such food may cause pressure on the heart and interfere with its action. Only such work or exercise should be undertaken as will not put a strain upon the heart as otherwise compensation may be broken and serious symptoms result. Such symptoms may be relieved by administering a teaspoonful of aromatic spirits of ammonia in water or a teaspoonful of bicarbonate of soda in a glass of hot water. It may be necessary to give a quarter of a grain of morphine sulphate with a one one-hundred-and-twentieth of a grain of atrophin sulphate. If the patient faints, her clothes should be loosened and she should be laid flat upon a couch or the floor with the head lowered. When there is shortness of breath the patient is usually more comfortable sitting up and should be allowed to rest in an easy chair or be propped up in bed. Every person with chronic heart disease should place himself under the care of a physician and follow his directions.

SORE MOUTH.

This condition is met with more in children than in grown persons. Its chief causes are improper cleansing of the mouth, bad teeth, excessive use of mercury, and occasionally it accompanies scarlet fever, measles, tonsillitis, or sore throat.

Symptoms.—There is redness of the lining membrane of the mouth. The lips and gums may be swollen and the tongue indented by teeth marks. The saliva is increased and often dribbles from the corner of the mouth. The changes in this secretion may produce a disagreeable taste and cause the breath to be foul. There is pain and distress on taking food. Little white spots may appear, which in bad cases may terminate in small ulcers.

Treatment.—The baby's mouth should be carefully cleansed at least once each day with a clean cloth soaked in a solution of boric

acid (a teaspoonful of boric acid in a glass of hot water). If the mouth becomes sore, this solution should be used frequently, and especially after each meal. If the inflammation is severe, the mouth should be carefully swabbed out with a solution of nitrate of silver (silver nitrate, 1 grain; water, 1 ounce) or with a solution of carbolic acid (carbolic acid, 1 grain; water, 1 ounce). Only a small amount of either solution—just enough to wet the swab—should be employed. The swab is best made by tying a little absorbent cotton on a small stick. Ulcers will often heal if touched with a piece of lunar caustic after carefully drying the surface. Spongy gums may be relieved by the application of tincture of myrrh diluted with equal parts of water.

SORE THROAT (TONSILLITIS, QUINSY).

Sore throat is a common disease. It is usually the result of exposure to wet and cold. Talking, laughing, or shouting in a damp, cold atmosphere is sometimes the cause of it. It may accompany or be an extension from an ordinary "cold in the head." It is a complication of diphtheria, scarlet fever, smallpox, tuberculosis, and syphilis. It is caused also by drinking milk drawn from cows with sores on their teats. Sometimes the inflammation is limited to the mucous membrane of the pharynx and soft palate; it is then known as pharyngitis or acute catarrhal sore throat. More frequently the tonsils are affected, and the inflammation is then called tonsillitis. When the inflammation is more deeply seated behind the tonsil and tends to suppurate or form an abscess, the term "quinsy" is applied. An attack of sore throat may last from 2 to 10 days, or longer.

Symptoms of acute sore throat are chilliness and feverishness, pain or soreness on swallowing, dryness, or a tickling or scratching sensation in the throat.

There is liable to be stiffness and some tenderness along the side of the neck. If one or both tonsils are involved, as they usually are to a greater or less extent, the symptoms are more severe. In marked cases examination shows redness and swelling of the parts affected—swollen tonsils (tonsillitis) and white or cream-colored spots may be seen on the surface of one or both tonsils. (This form of the disease is frequently mistaken for diphtheria.) There may be high fever and great prostration.

In the severest form of tonsillitis (quinsy) the tonsil is hard and swollen to twice or three times its natural size, and the patient is unable to swallow or to open his mouth beyond a fraction of an inch. The saliva dribbles away; if suppuration occurs the tonsil gradually softens until the abscess breaks. With the discharge of pus the severe pain is relieved and the patient rapidly recovers.

If the abscess is large, and if the pus is discharged in a backward direction there is danger from suffocation, particularly if the abscess break during sleep. Fortunately the abscess usually points toward the mouth, and the pus runs out.

Treatment.—Persons who are subject to attacks of sore throat should keep their feet dry and be careful not to catch cold. If a case develop, give a gargle of salt water or potassium chlorate and water (saturated solution), or boric acid and water may be applied to the tonsil. Dry bicarbonate of soda (baking soda) is highly recommended as a local application, a small quantity to be applied every hour. Apply cold water or a light ice bag to the neck, or a thick piece of flannel saturated with ice water may be placed around the neck and covered with muslin. Small pieces of ice placed in the mouth are usually agreeable. The bowels should be kept open by means of Epsom salts.

If the cold applications to the neck do not give relief, or if they are not agreeable to the patient, apply hot water or poultices and give hot gargles, or let the patient gargle with hot tea. If the swelling is very great, he can not gargle. If practicable, send for a physician.

DYSPEPSIA.

Dyspepsia is only a symptom of disease, and is often not due to the disease of the stomach itself. There are only two serious diseases of the stomach, ulcer and cancer, neither of which is a common complaint. Dyspepsia may result from nervousness. Emotional dyspepsia is very common. Everyone knows how bad news or worry will interfere with digestion and be followed by distress after a meal. Consumption is often accompanied by stomach trouble; in fact, this may be the only complaint made by a patient suffering from this disease. Disease of the heart, especially such as causes stagnation of blood in the abdominal organs; of the liver, such as is produced by alcohol or gallstone; of the intestines, particularly if there is constipation or obstruction of the free passage of the bowel contents; of the kidneys, as in chronic inflammation of those organs, where the waste products of the body are not fully eliminated; of the brain, as where there is a tumor or inflammation of the cerebral membranes—all give rise to stomach symptoms.

Symptoms.—There may be only a sense of fullness or distress after eating; there may be a burning or gnawing sensation in the center of the upper part of the abdomen or severe paroxysms of pain which double the patient up. These symptoms may be accompanied by nausea and vomiting or the eructation of gas or sour liquid. Gas may be passed from the intestines. The patient is inclined to be despondent and take a gloomy view of things in gen-

eral. There may be an absence of appetite, with weakness and loss of weight, resulting from the taking of an insufficient amount of food.

Prevention.—If a person has no serious disease he should be able to digest without distress nearly all classes of food. The cutting out from a diet of certain substances, such as fats, starches, or meats, may give rise to constipation and intestinal fermentation, which result in dyspepsia. It is not a good practice, therefore, to limit oneself to certain foods unless it is done under the order of a physician or until, after repeated trials, it is found that certain articles always disagree. Very often the fault is not in the food but in the state of mind of the eater. The simplest articles of food will sometimes cause dyspepsia if one is subject to worry of any sort. Constipation is one of the chief causes of dyspepsia, and its avoidance will often prevent this condition arising.

Treatment.—A teaspoonful to a tablespoonful of milk of magnesia taken every three hours will often allay dyspeptic symptoms. This medicine neutralizes the increased acidity of the stomach contents and also opens the bowels. A teaspoonful of bicarbonate of soda in a glass of water one hour after meals frequently acts as a preventive. Twenty grains of subcarbonate of bismuth taken with this soda is of value, but it may increase the tendency to constipation. A good plan is to alternate them; when the bowels are too loose, take bismuth; when constipated, use magnesia. A little peppermint added to these mixtures makes them more palatable. During an acute attack of dyspepsia it may be necessary to reduce the diet and only take a little milk or thin soup, but no permanent change in the diet should be made without the advice of a physician, as the dyspepsia may not only not be diminished thereby but it may even be increased by such a course. Great care should be taken to keep the bowels open by going to the closet at a regular time each day, even if there is no disposition for the bowels to move, by eating articles containing plenty of cellulose, such as coarse bread, wholewheat bread, oatmeal, etc. This substance forms part of the residue remaining after digestion and stimulates the intestines to contract, thus pushing the contents along. Fats, especially in children, tend to prevent constipation, and their absence from the diet will often cause this condition. Olive oil used in the form of salad dressing is one of the best means of correcting constipation. Fruits will often act in the same way. Cooked fruit, although not as efficacious as raw fruit in its action on the bowels, is less liable to disagree. Laxatives such as licorice powders, cascara, aloin, agar-agar, and Russian oil are often employed, but it is best not to use laxatives if the bowels can be regulated by the eating of a proper diet. Purgatives

such as salts, calomel, and jalap, which are somewhat violent in their action, should be rarely used, and then only when their need is clearly indicated.

DIARRHEA.

Acute diarrhea is caused by acute inflammation or by irritation of the intestines. It may occur as a complication in many different diseases. It is usually one of the symptoms of typhoid fever. It is not infrequently met with in severe cases of malaria. It is called functional or simple diarrhea when it occurs independently of any other appreciable disease. It may be caused by exposure to cold or by errors in diet.

In simple diarrhea there may or may not be griping and colicky pains. In the more severe forms the tongue is coated and there is some fever. Thirst is marked in proportion to the size and frequency of the thin or watery discharges. If the rectum is affected, there is a constant desire to go to stool, and a burning sensation and bearing-down pain, as in dysentery.

Diarrhea may last from a few hours to as many days, or longer. It may become chronic.

Treatment.—In all cases, rest and light diet. In the milder forms nothing further may be required. Twenty grains of bismuth subnitrate with 5 grains of salol may be given every three hours. In the more severe forms it is a good plan to begin with a dose of 1 or 2 tablespoonfuls of castor oil, to which 10 or 12 drops of laudanum may be added, or in place of the oil and laudanum Epsom salt may be given. The diet should be limited to light articles, such as cornstarch, gruel, weak broths, soft-boiled eggs, milk, and thoroughly toasted bread. As a rule, in very acute cases, the less food and drink taken the better. The patient should rest in bed and keep his body warm.

After the bowels have been freely moved by the oil or salts, if the diarrhea or pain continues, give one camphor and opium pill, and, if necessary, repeat the dose after an interval of three or four hours. If nausea and vomiting occur, apply mustard to the region of the stomach and give tablespoonful doses of equal parts of milk and limewater.

In chronic diarrhea careful attention to diet is of the greatest importance. The treatment is about the same as for chronic dysentery.

CHOLERA MORBUS (SPORADIC CHOLERA).

Cholera morbus is an affection of the stomach and intestines, attended by vomiting, purging, and cramps. It comes on suddenly, and may begin by vomiting or purging. It is usually met with during the hot months of summer. It is frequently caused by eating

unripe and indigestible fruits and vegetables, decomposed or improperly cooked fish, shellfish, or salad mixtures. Drinking large quantities of ice water and sudden checking of the perspiration, or irritants of any kind, may set up the trouble. The disease usually begins suddenly, often at night, with vomiting, after a feeling of uneasiness, nausea, or a severe cramp. The contents of the stomach are first thrown up, then a bilious matter. The stools are at first solid or semisolid, but they soon become more watery, lose their color, and sometimes appear not unlike the rice-water stools of genuine Asiatic cholera. The patient soon has a wasted look. His thirst is unquenchable. His skin may become cold and clammy and the pulse very weak. Cramps may occur in the feet and in the calves of the legs. The disease runs a rapid course. The acute symptoms may subside in a few hours. The attack seldom lasts more than 12 hours. Recovery is the rule, but treatment should be promptly applied.

Treatment.—Apply a large mustard plaster to the abdomen. Give 15 drops of laudanum. If the dose is rejected (immediately vomited), try it again. One-quarter grain of morphine sulphate may be given instead of the laudanum. If it is still not retained, then try 2 tablets of Sun Cholera Mixture. If vomiting quickly occurs, then inject into the rectum by means of a glass or rubber syringe about 20 drops of laudanum mixed with a little thin starch or a little water. The rectal injection should be given immediately after an evacuation, and the patient should be instructed to hold it as long as possible. In whatever way the remedy is given, the dose should be repeated in about one hour if the vomiting and purging continue.

It must not be forgotten, however, that all these remedies contain opium, and that if the patient is inclined to sleep or shows other constitutional effect of the drug the dose must not be repeated.

The nausea and thirst may be controlled by cracked ice placed in the mouth. Small quantities of carbonated water may be allowed. If the thirst is very urgent a tablespoonful of iced water may be given at short intervals.

COLIC.

Intestinal or spasmodic colic.—These terms are applied to abdominal pain occurring in paroxysms of different degrees of severity. The pain is usually referred to the region of the navel or middle of the belly. It may be due to indigestible food, cold or acid drinks, poisons, gases, or any irritating substance. It is often preceded by obstinate constipation. Vomiting frequently occurs.

Another variety of colic, called lead colic or painter's colic, is caused by lead poisoning. It is not uncommon in painters or workers in lead. It may be caused by drinking water taken from lead

pipes. An attack may be mild or exceedingly severe. It is usually attended by obstinate constipation and by contraction of the abdomen.

The severe paroxysmal pain attending the passage of a gallstone from the gall bladdder to the intestine is called biliary colic. In biliary colic the pain is usually most marked in the region above the navel or about the stomach (epigastric region). The paroxysms begin and end suddenly. Severe nausea and vomiting occur. The skin and eyes may become yellow or of a yellowish hue (jaundiced). Gallstones may occasionally be found in the stools, if carefully looked for. Some cases, however, are difficult to distinguish from ordinary intestinal colic.

The severe excruciating pain caused by the passage of a small rough stone or calculus or particles of sandy substance from the kidney through the ureter to the urinary bladdder is called nephritic colic, kidney colic, or an attack of "the gravel." The pain usually begins with a one-sided, boring backache. Suddenly it increases in intensity and shoots down the loin to the hip and thigh, and the patient writhes in agony until the "stone" or particle, sometimes not larger than the head of a medium-sized pin, reaches the bladder, when the pain suddenly ceases. The paroxysm may last from half an hour to a number of hours, or one or two days. It may not recur for months or years; on the other hand, there may be two or more paroxysms at comparatively short intervals.

Colicky pains are present in many different diseases. Appendicitis frequently begins with pain not unlike that of intestinal colic. (See p. 169.)

Treatment.—If the colic is due to indigestible food, or too much food of any kind, an emetic should be given, such as mustard and water.

After the stomach is emptied give a teaspoonful of aromatic spirits of ammonia in water. Apply a large mustard plaster or a hot poultice or cloths wrung out of hot water, or heat of any kind to the abdomen. (Local applications of hot water usually afford some relief in any variety of colic or wherever pain exists.) If the colicky pains persist, 10 or 12 drops of laudanum or one-quarter grain of morphine sulphate should be given by the mouth, and repeated, if necessary, in two hours; or 30 or 40 drops of laudanum in a little water or starch may be injected into the rectum.

If the bowels were constipated when the attack began, an injection of soap and warm water should be given by the rectum, or small doses of Epsom salt or castor oil may be given by the mouth. The diet for a day or two should be light food in small quantities at a time. The treatment for lead colic is about the same, except that the constipation should be relieved at once by full doses of Epsom

salt or castor oil. Apply heat to the abdomen or place the patient in a warm bath. Pressure applied to the abdomen affords some relief. Remove the cause or remove the patient from the cause of the disease.

In biliary colic the bowels should be freely moved, patient should be placed in a hot bath, and laudanum. 30 drops, given to relieve pain.

In nephritic or kidney colic hot baths and laudanum, 30 drops, are the remedies. For the treatment of infantile colic see p. 193.

APPENDICITIS.

Appendicitis is an inflammation involving the appendix vermiformis. This is a small attachment of the large intestine situated in the right lower portion of the abdomen. It may begin suddenly with violent pains in this region, some fever, colicky pains, nausea, and vomiting. The seat of the pain is usually on a line drawn between the bony prominence (the large bone of the pelvis) just above and on the outer side of the right groin and the navel. As the attack progresses, that region of the abdomen may become hard like a board and exceedingly sensitive to the touch. Often you will find that the patient bends the right leg on the abdomen, and the effort to straighten it out causes him great pain. Sometimes the attack is much milder, with only an uneasy sensation in the affected region, very slight fever, if any, and a sense of tenderness over the part affected. This pain may be in the pit of the stomach or about the navel.

After this pain has been present for a few days a swelling may appear, due to the formation of pus or to a large protective exudation of lymph.

Treatment.—The right course to pursue in a case of appendicitis is to immediately call a surgeon. If the services of a surgeon or physician can not be secured, the plan of treatment should be as follows: Absolute rest in bed with an ice bag over the appendix, to be continued during the stage of severe pain. Do not give purgatives. Only a small quantity of liquid diet should be given. If the pain is severe, 20 drops of laudanum or a quarter grain of morphia sulphate in a little water may be given to control it. If the bowels move, a bedpan should be used, and under no circumstances should the patient be allowed to get up.

PILES.

Piles are varicose dilatations of the veins of the rectum. The symptoms may be slight or severe. Inflamed piles are very painful. There is a constant burning sensation at the anus, which is greatly increased during and immediately after each movement of the bowels.

When the veins rupture you have "bleeding piles." Occasionally the inflammation of a nodule results in an abscess.

Treatment.—Piles are frequently due to habitual constipation, and when that condition is remedied the piles often disappear, or at least cease to be troublesome. The bowels should be kept in good condition. One easy movement should take place regularly every day. This desirable habit should be brought about by careful attention to diet and by drinking water in the morning before breakfast rather than by the use of cathartics.

In acute attacks, if the bowels are constipated, give a full dose of Epsom salt; put the patient on light, soft diet. Apply ice to the anus or inject cold water into the rectum. An ointment composed of 5 grains of menthol mixed with 2 tablespoonfuls of vaseline often affords great relief. If the piles protrude, especially if they become strangulated, they should be pushed back with the finger; olive oil or vaseline may be applied. If the piles are large and persistently painful, see a surgeon and have them removed by operation, which is the only sure cure.

KIDNEY DISEASE (NEPHRITIS).

Acute nephritis.—This condition follows exposure to cold and dampness, extensive burns, alcoholic intemperance, poisoning from turpentine, potassium chlorate, carbolic acid, cantharides, mercury, and lead. It may also be a sequel of scarlet fever, diphtheria, typhoid fever, smallpox, pneumonia, and a complication of tuberculosis. It occurs in pregnancy, being probably due to renal congestion caused by the mechanical pressure of the womb, or to the altered blood condition.

Symptoms.—The quantity of urine is diminished from 40 to 50 ounces a day to from 5 to 20 ounces a day. The color is a dark red or brown and it will be found to contain albumen if a teaspoonful is boiled with a few drops of vinegar. The presence of albumen is shown by the formation of a cloud in the urine and a deposit will settle upon the bottom upon cooling. Normal urine does not contain albumen. Other symptoms present may be headache, nausea, vomiting, shortness of breath, diarrhea, dropsy, convulsions, or unconsciousness.

Chronic nephritis.—Chronic nephritis may follow an acute attack. It more often, however, comes on slowly without acute manifestation. Drinkers of beer and other alcoholic liquors and those who eat large quantities of meat seem to be liable to the disease. Syphilis and malaria also cause nephritis. It is one of the results of old age, nearly all old persons having at least some symptoms of the disease.

Symptoms.—The symptoms of chronic nephritis are similar to those of the acute disease, but they may manifest themselves in a mild

form, so mild that a diagnosis can not be made until the urine is examined. In one form of the disease the urine is of a pale yellowish color and may be greatly increased in quantity, sometimes from 2 to 4 quarts being passed in a day. There may be only a trace of albumen or it may be absent altogether at times.

Treatment.—The treatment of the acute form and the chronic form when acute symptoms intervene is profuse sweating and free catharsis. The sweating may be produced by wrapping the patient in a sheet wrung out of hot water and then rolling him up in blankets. Children may be given a hot bath and then wrapped up in blankets. Sometimes a frame to which a number of electric lights are attached is placed over the patient when lying in bed and the whole covered with blankets. When the lights are turned on the heat of the lamps causes the patient to sweat. The patient should be watched and at any evidence of exhaustion the sweating should be discontinued. Catharsis is best produced by salts, either Epsom or Rochelle. The patient should be placed upon a milk diet and be given plenty of water to drink.

Persons suffering from the chronic form of the disease should be careful not to expose themselves to cold and wet, should eat sparingly of red meats, and avoid alcoholic drinks. If dropsy is present a salt-free diet is indicated. If possible, the patient should live in a warm, dry climate.

DELIRIUM TREMENS.

Delirium tremens occurs as an incident in the life of persons addicted to the excessive use of intoxicating liquors.

Loss of appetite, sleeplessness, or a marked mental depression are the chief symptoms of the first stage of the affection which is known among drunkards as "the horrors."

As the disease advances the patient talks incoherently; has a wild expression; his mind wanders from one thing to another. He answers questions in a rambling manner. He fancies he is being pursued by wild animals or that he sees rats, snakes, and other animals crawling on the walls or around his bed, or he may imagine himself to be engaged in his regular duties or as master of a ship, giving directions to the men.

The delirium is always worse at night, but the patient requires careful watching all the time. He may try to jump out of a window or commit suicide.

Delirium tremens may be confounded with acute inflammation of the brain or with acute mania (insanity) or with certain forms of pneumonia, and any one of these diseases may also be present. Pneumonia is a frequent complication of delirium tremens, and in fatal cases may be the direct cause of death.

In favorable cases the symptoms begin to improve in three or four days from the onset. The patient sleeps and gradually recovers.

Treatment.—The patient requires constant attendance. Physical restraint should be avoided if possible. To support the patient and to procure sleep are the great objects of treatment. Careful feeding is very important. Milk or concentrated broths should be given at regular intervals of two hours. A cold bath is of value in some cases, especially if agreeable to the patient. In other cases a warm bath or a hot foot bath may have a better effect.

The serious symptoms are largely, if not entirely, due to the sleeplessness, and if several hours of sound sleep can be procured improvement is almost sure to follow. To this end bromide of potash, in 30-grain doses, may be given in water every three hours. Morphine or opium are not to be recommended in this disease, except under the immediate direction of a physician. All stimulants should be withheld, except in rare cases when the pulse is weak. The giving of whisky, gin, etc., in small doses to gradually "sober him up," is a bad practice, as it delays the patient's recovery. No amount of begging for stimulants on the part of the patient should persuade his attendants to break this rule.

SUNSTROKE.

The term "sunstroke" denotes a sudden attack of illness from exposure or prolonged exposure to the rays of the sun; but the same condition may be produced in hot weather by exposure to high temperature not in the direct rays of the sun, particularly if the person is engaged at hard work in close quarters. Stokers on steamships are sometimes affected by the heat of the furnace. Men debilitated from or addicted to the excessive use of stimulants are more apt to suffer than those of temperate habits.

Sunstroke occurs in two forms: Heat stroke (heat fever), in which the temperature of the body is very high, and heat prostration or heat exhaustion, in which the surface of the body is cool, sometimes considerably below normal. The difference is very important because of the different treatment required.

In severe cases of heat stroke the patient may be stricken down in a state of unconsciousness and die instantly or within an hour or two. In other cases there may be intense headache, dizziness, marked restlessness, nausea and vomiting, and hot "burning" skin. The thermometer may register 105° F. Pulse is full and may be slow or fast. Breathing is labored, may be sighing or rattling. Patient soon becomes unconscious, the stupor deepens, and death may occur within 24 hours; or the temperature may drop, consciousness may return, and the patient get well.

In heat prostration, as already stated, the surface of the body is cool, the pulse rapid and feeble, and there is a feeling of general weakness. There may be only slight faintness and nausea, and under prompt treatment patient may rapidly recover, or, on the other hand, there may be complete loss of consciousness and a rapid and fatal termination from exhaustion.

Heat cramps.—Painful spasms of the muscles, especially those of the abdomen and limbs, may occur when persons who are exposed to high temperatures are required to perform hard labor. Stokers on steamships are liable to suffer from them. They are extremely painful, making the patient cry out; there is headache, and the bowels are constipated. In some cases the patient is unconscious, and the convulsions resemble those of epilepsy. The attacks may last from 12 to 24 hours, but even after the patient becomes quiet the spasms may be renewed by a slight stimulus, such as a cold draft or a sudden movement. The muscles are sore and the patient weak and listless for several days following the seizure. The cases vary greatly in intensity; there may be simply a slight cramp in the abdomen or in one of the muscles of an extremity.

Prevention.—The temperature and humidity of inclosed places like firerooms of ships, weaving rooms, etc., should be regulated so as to prevent the temperature of the air from rising above 86° F. and the moisture 80 per cent. This may be accomplished by the use of fans to keep the air in motion. Cold air may be forced into these places or hot air exhausted by the same means.

Treatment.—In heat stroke (fever heat) the temperature of the body should be reduced as rapidly as possible. Place the patient in a cold-water bath, add ice, rub the body with the blocks of ice, apply ice water with ice cap to his head, and keep up the treatment until the temperature, as shown by the thermometer in the rectum, is reduced to 100° F. If the temperature rises again, repeat the treatment. If symptoms of exhaustion follow the reduction of the temperature, stimulants should be given—strychnine sulphate, one-fortieth grain.

In heat prostration, with cool skin, weak and rapid pulse, stimulants and friction are required. Give strychnine sulphate, one-fortieth grain, rub the surface of the body and the extremities, place hot-water bottles to the feet, and cover the body with blankets. If the head is hot, apply cold water to the forehead. If vomiting occurs, inject hot salt solution (one teaspoonful of salt to a pint of water) into the rectum. Apply a mustard plaster over the region of the stomach. Mustard plasters may also be applied to the feet.

Heat cramps.—Twenty drops of tincture of nux vomica in a glass of water taken three times a day will often prevent these cramps.

Oatmeal water should be used by the firemen to quench their thirst. If a fireman feels faint, a cup of strong tea will frequently revive him. The minor spasms in the muscles of the arms and legs are usually treated by the men themselves by rubbing each other. When the cramps are severe the patient should be placed in a hot bath, the muscles vigorously rubbed, and large quantities of hot water given by the mouth and injected into the bowel. Thirty grains of bromide of potash should be given in half a glass of water. If the patient can not retain this, 60 grains in a pint of water should be administered by the rectum. The next day every effort should be made to get the patient's bowels opened by giving him castor oil or salts or by injection of soapy water.

HEADACHE.

Headache is a symptom of disease of some portion of the body. When it is unilateral, localized, sharp, and paroxysmal it is known as neuralgia. It may be caused by many conditions, among which may be mentioned derangements of the stomach and liver, constipation, neurasthenia, eyestrain, heat exhaustion, exposure to cold and dampness, inflammation of the kidneys or genital organs. It is present in malarial fever, typhoid fever, smallpox, syphilis, diabetes, and influenza. In meningitis or inflammation of the coverings of the brain the pain in the head is excruciating. Many of the diseases of childhood begin with headache.

Treatment.—Remove the cause if possible. Open the bowels with a dose of castor oil or salts. Take 10 grains of aspirin and repeat if necessary in three hours. A little hot tea and toast should be given with this medicine to prevent nausea. If the headaches are frequent, a physician should be consulted to ascertain the cause.

CONVULSIONS.

Convulsions are a symptom of many diseases. They commonly occur in children after eating indigestible food and at the beginning of any serious disease. They may be present in disease of the brain and kidneys, rickets, epilepsy, apoplexy, hysteria, after poisoning from many drugs, and in women during pregnancy or after the child is born.

Treatment.—During an epileptic fit nothing can be done except to keep the patient from injuring himself. A cork or other similar object should be wrapped in a handkerchief and placed between the patient's teeth to prevent his biting his tongue. Twenty grains of bromide of potash three times a day will sometimes ward off an attack.

If a child has a convlusion, it should be put into a lukewarm bath. Cold compresses may at the same time be applied to its head. A mustard plaster may be applied to the back of the neck, being careful to leave it on only long enough to redden the skin. A solution containing bromide of potash (15 grains in 2 tablespoonfuls of water) may be injected into the child's bowels or 5 grains may be given by the mouth.

In the convulsions of pregnancy little can be done by the layman, except to keep the patient's bowels open, give the patient warm baths, and keep her wrapped in hot blankets, hoping to eliminate the poisonous substances through the skin. If there is electricity in the house, an apparatus described on page 171 may be used to make the patient sweat.

POISON IVY.

Contact of the skin with poison ivy causes in many people a very annoying inflammation of the skin. The vine is of the climbing variety, with three pointed leaves on each stem. A few hours or about a day after the skin is exposed to the poison of this plant a red rash appears, with more or less swelling and itching; small blisters appear, filled with serum, even becoming quite large. When they burst there is considerable weeping from the surface. Later it may go on to a formation of pus. The hands and face, being the most exposed parts of the body, and the feet and ankles of those who go barefooted, are usually first affected. If the inflammation is very severe, there may be some incidental disturbance, such as fever, headache, and general feeling of malaise.

Treatment.—One of the best treatments for this disease is bathing with salt water, sea water being the best. Boric acid, 1 teaspoonful in a glass of hot water, is a good application. The large blisters should be punctured and the contents allowed to run out. Every one or two days the affected parts should be bathed with warm water, carefully dried without rubbing, and the boric acid treatment resumed.

BOILS.

A boil is a circumscribed inflammation of the skin and connective tissue. It is often caused by infection following a slight wound or scratch of the skin, but may occur apparently without any cause. It begins as a small red pimple and gradually increases in size and forms a dusky red swelling the size of a silver dollar or less. The central portion of the swelling sloughs or forms a "core," and as soon as the core is separated or cast off the inflammation subsides, the pain lessens, and the ulcer begins to heal.

Treatment.—Compresses made of aseptic gauze or clean white cotton cloth wet with a 1 to 5,000 hot solution of bichloride of mer-

cury should be applied every two hours until the central portion of the boil is softened. The bichloride solution should be made in a metal basin or some utensil not employed in cooking or for holding drinking water. The solution should be heated each time it is used, and in the intervals it should be kept upon a high shelf, so that no person or animal may be poisoned by it. The separation of the core of the boil may be aided by an incision. This incision should be made through the thickened tissues of the edge of the boil by a thin sharp blade previously sterilized by boiling. The blade should be wrapped in cotton before boiling, and a little soda added to the water to prevent the edge of the knife from becoming dull. The knife may also be sterilized by placing it for a half an hour in a 3 per cent compound cresol solution (see p. 104), which does not injure metals. After the core is discharged, the ulcer should be washed daily with the bichloride solution and dressed with dry sterile gauze.

ABSCESS.

An abscess is a circumscribed collection of pus. It may occur in any part of the body. The local symptoms are those of inflammation, redness, heat, pain, and swelling. There may be constitutional symptoms consisting of chills, fever, and sweats. A "cold abscess" is due to bone tuberculosis. It has received this name because it develops slowly and presents but few of the signs of inflammation. The patient may not be aware of its existence until a swelling is noticed.

Treatment.—An abscess should be opened and the contents evacuated. A sharp knife should be disinfected by placing it for half an hour in a 3 per cent compound cresol solution or a 3 per cent carbolic acid solution. (See p. 104.) The hands should be scrubbed and disinfected with the same solution, and the abscess should then be opened by quickly plunging the blade into the abscess cavity and cutting outward. The abscess should then be washed out with a weak bichloride solution (see p. 175) and a small piece of gauze soaked with the solution should be left in the opening to keep it from closing before the abscess heals from the bottom. A gauze compress should then be placed over the abscess, and a bandage should be applied to keep it in place. The dressing should be renewed daily. An abscess should not be opened by a layman if it is possible to secure the services of a physician, as there is danger of doing serious injury to blood vessels and other important structures if care is not exercised. If the abscess is situated near one of the large vessels it is better to first carefully cut through the skin and then open the abscess by separating the tissues with a blunt instrument (the end of a sterilized wooden penholder is suit-

able for this purpose). The location of the large blood vessels is shown in figures 138, 139, 140, 141, 142, 143, 144.

A cold abscess should not be opened by a layman. The patient should be kept quiet in bed until the services of a physician can be secured. If the abscess ruptures, a compress composed of absorbent cotton wrapped in gauze should be applied. Care should be taken by the dresser to disinfect his hands before he handles the dressing materials, as they should be kept as clean as possible.

SORE EYES.

Conjunctivitis.—This is an inflammation of the membrane covering the eye. It is caused by foreign bodies, grit, and particles of dirt which lodge upon the eye, exposure to cold, irritating gases and other chemicals, and the action of numerous bacteria. It is a complication of many diseases, such as pneumonia, syphilis, gonorrhea, diphtheria, measles, and influenza.

Symptoms.—The eye is painful and feels as though there were grains of sand between the eyeball and the lid. This pain is increased by exposing the eyes to light. The eyeball is red and the lids are swollen. There is an increased flow of water from the eye which runs down over the cheeks in tears or is discharged in the nose through the tear duct.

Treatment.—The eye should be washed out every two hours with a solution of boric acid (one teaspoonful of boric acid in a glass of hot water). In doing this the eyelids should be held apart, but great care should be taken not to press upon the eyeball, as it may be injured thereby. A few drops of a solution composed of zinc sulphate ($\frac{1}{2}$ grain; water, 1 ounce) should be dropped into the eye every three hours. A 10 per cent solution of argyrol or a 5 per cent solution of silvol may be used for the same purpose.

Iritis.—This is an inflammation of the iris, the muscular curtain in the eyeball which separates the anterior from the posterior chamber. It is an affection which accompanies syphilis, acute rheumatism, diabetes, tuberculosis, gonorrhea, etc. It may occur as the result of extension of inflammation from other eye structures.

Symptoms.—There is a red ring just back of the cornea (the clear portion of the eye which forms the front of the eyeball). The pupil or dark spot of the eye, instead of being round, may be oval or irregular in shape. The eye is painful and many of the symptoms of conjunctivitis are present.

Treatment.—The eye should be washed out with boric acid solution and a drop of 1 per cent solution of atropin sulphate should be placed in it three times a day. Keep the patient in a dark room.

Preventable blindness.—One-half of the blindness of the world is said to be preventable. One-quarter of the blindness of children is

due to gonorrhea, and one-tenth to the carelessness of the doctor or midwife when the child is born. Other causes of blindness are trachoma, syphilis, the poisonous effects of wood alcohol, tobacco, and lead, uncorrected errors of refraction, injuries, and inflammation due to pus organisms. The blindness of the new born is due to infection received from the birth canal of the mother, and for this reason a few drops of a 1 per cent solution of nitrate of silver (4½ grains of nitrate of silver to 1 ounce of water) or a 10 per cent solution of argyrol (see p. 87) should be dropped in every baby's eyes as soon as it is born, except in cases where it is positively known that no infection of the birth canal of the mother is present. The eyes should first be cleaned with a solution of boric acid, a separate piece of absorbent cotton being used for each eye; the lids then carefully separated and one or two drops of the silver nitrate or argyrol solution placed in each eye between the outer ends of the lids, which should be separated so that the solution may enter the space between the eyelid and the eyeball. Care must be taken not to touch the delicate membrane of the eye with the eye dropper. Only one application of the solution is necessary.

Trachoma.—Trachoma is a chronic infectious disease of the lining membrane of the eyelids, communicable to others by means of towels, handkerchiefs, fingers, or other articles which transfer the infected discharges from the eyes of those suffering with the disease. It may begin as an acute inflammation, but more often its onset is insidious, and the patient may not be aware of its presence for some time. The lining membrane of the eyelids becomé thickened, the eyelid is heavy, and drops over the eyeball. In severe cases the patient shuns the light on account of the pain it causes. If the lids are everted, a number of small granular bodies, resembling sago grains, will be noticed. There is also a mucopurulent discharge present, more abundant in some cases than in others. The disease produces a roughened condition of the inside of the lid which irritates the front of the eyeball, causing an inflammation of that structure which often leads to blindness.

Prevention.—The disease occurs among Indians and persons who live in the mountains of Connecticut, Tennessee, and Virginia, or who dwell in the thickly populated portions of large cities; in fact, it is prevalent among those persons who have not the conveniences to live properly. To prevent its spread, each member of the family should have his own towel, handkerchief, and wash rag. The wash basin should be scalded, if used by more than one individual, after each washing. No person should sleep with another who has trachoma, or on a bed that has been slept in by such a person. Children with trachoma should not be allowed to go to school until cured. The patient should place himself under the care of a physician and strictly follow his directions

EARACHE.

The ear consists of three portions—the external, middle, and internal ear. The middle ear is a little cavity which communicates with the nose by a small tube. It is situated at the bottom of the ear canal from which it is separated by the eardrum. Pain in the ear is usually caused by inflammation of the lining membrane of the middle ear. This becomes swollen and the tube leading to the nose is blocked up, which results in an accumulation of fluid in the middle ear cavity. The pressure of this fluid causes pain, which is not relieved until the tube becomes open or the eardrum ruptures, allowing the fluid to escape through the ear canal. This inflammation often follows cold in the head and it is much more likely to occur if there are adenoids, large tonsils, or other obstruction of the nose which renders the free passage of air difficult. Acute catarrh of the ear also frequently accompanies scarlet fever, measles, pneumonia, smallpox, typhoid fever, and tuberculosis.

Symptoms.—Pain may be entirely absent in catarrh of the middle ear, but it is usually very severe. The patient also complains of fullness in the ears, dizziness, and deafness. A baby or child will often pull at its ear as if it felt some obstruction in the ear canal. Whenever a baby appears sick and the cause has not been ascertained it is well to think of earache. Touching or gently pulling on the ear makes baby cry out with pain. On account of the warmth it usually prefers to lie with the affected ear against the pillow. There is generally a rise of temperature, but this is not always the case. The pain is relieved when the eardrum ruptures and there is a discharge of serum and pus from the ear canal.

Prevention.—Adenoids and large tonsils should be taken out. The inflammation of the lining membrane of the nose should be treated and bony processes or other obstructions in the nose removed. Children should sleep with the windows open at night, and if they are strong and robust cold tub baths should be given in the morning upon arising. A child should not be permitted to play with children suffering from colds and in the wintertime should be kept out of street cars and other crowded places where the danger of infection is greater.

Treatment.—Heat should be applied to the ear, either by means of a hot-water bottle or by hot cloths. The applications should be continued for half an hour and should be renewed every two hours. During the intervals between the application of heat the ear should be kept warm. A warm solution of carbolic acid and glycerin should be instilled in the ear—a few drops every two hours. Care should be taken to see that the drops run into the ear canal and are not merely deposited on the outside of the ear. The carbolic acid and

glycerin mixture is made by thoroughly mixing 1 dram of carbolic acid with 7 drams of glycerin. Half a grain of Dover's powders or four drops of paregoric may be given to a child 1 year old, and proportionate doses for children of other ages. The opiate should not be renewed unless the pain is severe. The child's bowels should be kept open by giving it a small dose of salts or castor oil.

Accumulation of wax in ears.—Wax is secreted by numerous small glands in the auditory canal. In health it disappears by evaporation or is forced out by the movement of the jaws. In adults, and less often in children, the wax accumulates in the ear and forms a hard plug. This is most likely to happen after water or soap has entered the ear or in persons engaged in greasy and dusty occupations. Picking the ears with pins sometimes causes slight inflammation of the skin with exfoliation of epithelium, which, mixing with the wax, forms a plug. The impacted wax causes deafness, but no other symptoms unless it presses against the eardrum, when it may produce pain, vertigo, vomiting, and general nervousness and irritability.

Treatment.—The wax may be softened by dropping into the ear a few drops of a solution of glycerin and water, half an ounce of each, to which 20 grains of bicarbonate of soda have been added. After this has been used a day or two several drops of peroxide of hydrogen may be placed in the ear and the ear then washed out with warm water containing a teaspoonful of bicarbonate of soda to the pint. The stream should be thrown well into the opening of the canal, but without much force, as otherwise fainting may be produced or the eardrum injured. The washing out the ear canal is sometimes effective without the preliminary use of the ear drops.

FIG. 132.—Gonococcus in urethral discharge. *a*, Free cocci in groups; *b*, the same inclosed in cells.

FIG. 133.—Nurse visiting a reported case of sore eyes.

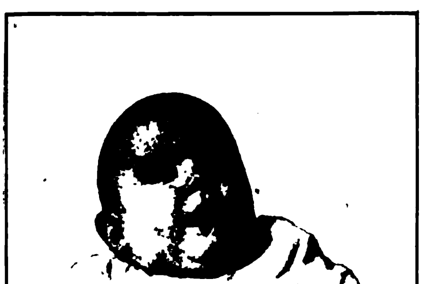


FIG. 134.—This baby was attended by a physician who neither reported the birth nor the inflamed eyes. The baby is blind for life.

FIG. 135.—This baby's sore eyes were reported and his sight saved by prompt medical and nursing care.

FIG. 136.—Inflamed hand and arm following a small wound. (From Da Costa's Surgery. Courtesy W. B. Saunders Co.)

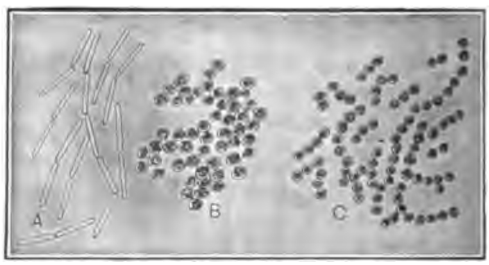


FIG. 137.—Different forms of pus producing bacteria. (From Richie's Primer of Sanitation. Courtesy World Book Co.)

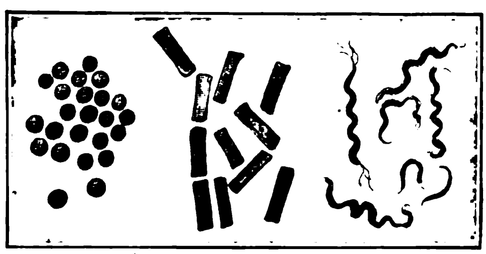


FIG. 138.—Forms of bacteria. (From Richie's Primer of Sanitation. Courtesy World Book Co.)

FIRST AID TO THE INJURED.

By Surgeon M. H. FOSTER,
United States Public Health Service.

WOUNDS.

DESCRIPTION.

Injuries in which the skin has been opened, torn, or punctured are called wounds. There are many varieties of wounds. The most important kinds will be described later on.

Severe wounds may inflict great damage to the muscles, bones, vessels, or internal organs, but in all wounds there is a secondary danger that severe inflammation may follow. The likelihood of inflammation exists in small wounds as well as large ones; hence all wounds must be handled carefully to avoid this complication, as even a trivial injury like the prick of a pin has been known to result in death from this cause.

THE CAUSE OF INFLAMED WOUNDS.

It is a matter of every-day experience that the countless little cuts and scratches which every person receives during a lifetime almost always heal without trouble, no matter whether treated or not. It is also well known that occasionally these small injuries, and more often the larger ones, do not do well. The wound becomes red and painful, it throbs, the edges swell, and finally matter develops. This matter is called "pus." When the matter escapes the pain ceases and the cut gradually heals. At other times the redness rapidly spreads, the swelling increases, pain becomes worse, tender kernels form in the groin or armpit and in a short time the entire arm or leg, as the case may be, becomes involved (fig. 136). Taken at this stage, prompt and vigorous surgical treatment may produce a cure, but if neglected the condition steadily grows worse and sometimes ends in death. It was formerly believed by most people that these unfavorable terminations of small wounds were due to "catching cold" in the wound. It is now known that the inflammation of wounds is always due to the presence of bacteria or pus germs, as they are commonly called (fig. 137).

DESCRIPTION OF GERMS.

These germs or bacteria are the smallest of all living things. Even when magnified by a powerful microscope they are not the fierce-looking animals with eyes, teeth, legs, etc., which are frequently represented in the newspapers, but in reality plants of the simplest kind. These minute plants occur in various forms; some resemble balls, others rods, and a few are spiral in shape similar to a piece of broken corkscrew (fig. 138). Like all other plants, they require warmth, water, and food in order that they may grow and flourish. All bacteria can be killed by heat and certain powerful chemicals, such as tincture of iodine, carbolic acid, or bichloride of mercury. Germs are so exceedingly small that it is difficult to get a correct idea of their real size. Millions of them can float around in a drop of dirty water without touching. One writer gives a good idea of their relative size by stating that if one of them were placed alongside of a man and both were magnified sufficiently to make the bacteria about the size of a period in a newspaper the man would appear as high as Mount Washington. These little parasites are found practically everywhere. They are on the walls and floors of dwellings, on our clothes, in our mouths, and on and in the outer layers of the skin. Water, except that from very deep wells, contains them, and they are very numerous in the upper layers of the soil. They are so small that they can not be felt or seen by ordinary means, but they are present on practically all objects just the same. It must not be understood that all bacteria will attack the human body or produce disease. Some of them are actually beneficial to man, many of them are harmless, and only a few, when introduced into the system, will cause disease or set up inflammation. The latter kind, the dangerous bacteria, are often called *germs*.

Bacteria multiply by the simple process of dividing into two. A groove forms around the germ; it gradually becomes deeper, finally cuts the germ into two parts, and in a short time there are two bacteria where there was one before (fig. 140). Under favorable circumstances this process of division may occur in as short a time as 20 minutes. The two resulting bacteria also divide, and the multiplication continues as long as the proper conditions of food, moisture, and temperature are present. One bacteria is capable in this way of producing 17,000,000 of descendants in 24 hours. It has been estimated that if all the bacteria in the world were placed under the most favorable conditions that in two days they would fill all the oceans and cover the earth 50 feet deep. Fortunately there are a great many things which hinder the development of microorganisms and no such invasion ever takes place.

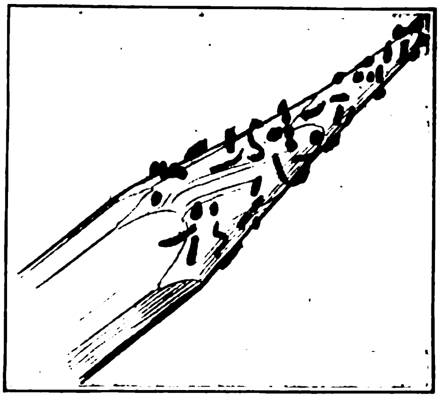


FIG. 139.—Showing how a pencil point would look if the bacteria were magnified and the pencil kept its original size. (From Richie's Primer of Sanitation. Courtesy World Book Co.)

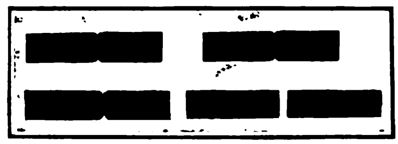


FIG. 140.—Method of division of bacteria. (From Richie's Primer of Sanitation. Courtesy World Book Co.)

FIG. 142.—Method of removing sterile dressing from container.

FIG. 143.—Method of handling sterile gauze when dressing a wound.

FIG. 144.—Making a swab, and finished swabs.

FIG. 145.—Wound of the forefinger, step one. Cleaning the hand and adjacent parts.

FIG. 146.—Wound of the forefinger, step two. Painting the finger with half-strength tincture of iodine.

The skin is so constructed as to prevent the entrance of germs into the system as long as it is not broken or injured. The skin from this standpoint may be compared to the can in which canned meat is preserved. As long as the can is perfectly tight the meat keeps sweet, but if the can is opened or a hole punched in it the contents very quickly spoil and this putrefaction is due to the entrance of bacteria. The system possesses certain powers of resistance against the action of these little parasites, and ordinarily when a few are introduced they are promptly destroyed before they can do any damage. However, when a large number gain access to the body, or when certain very powerful ones are introduced, or if the person is debilitated, they are sometimes able to multiply and set up a great deal of mischief.

VARIETIES OF WOUNDS.

1. *Incised wounds.*—When the skin or tissues are cleanly cut with a sharp instrument, such as a knife, razor, or piece of glass, the injury is called an incised wound. Wounds of this description bleed very freely, but are likely to heal quickly if properly treated and leave but slight scars.

2. *Lacerated wounds.*—Lacerated wounds are caused by some blunt instrument which tears and bruises the flesh. A good example of a lacerated wound is the gash which may be torn in the arm of a butcher by a meat hook. The injuries caused by machinery, such as crushing the fingers in cogweels or crushing the foot under a car wheel, are lacerated wounds. Such injuries, as a general thing, do not bleed as freely as incised wounds, but there is great danger of inflammation, because almost always bacteria are introduced into the wound and the torn and bruised tissue has very little power of resisting them. Great care must therefore be used in handling and dressing these injuries. Lacerated wounds heal slowly and often leave extensive scars.

3. *Punctured wounds.*—Punctured wounds are produced by narrow sharp-pointed instruments such as nails, daggers, or bayonets. Bullet wounds are also included under this classification. The danger from such wounds are twofold. Important internal organs may be injured and bacteria are likely to be carried deeply into the tissues where the conditions are very favorably for their growth. Such wounds are difficult to disinfect, and if pus develops it is apt to spread widely. A much dreaded result of punctured wounds is lockjaw or tetanus. This is especially apt to follow punctured wounds of the feet caused by stepping on a nail or the tooth of a rake. In modern warfare locklaw is sometimes a complication of gunshot wounds. (See Tetanus, p. 196.)

Symptoms of wounds.—The injury itself, pain, bleeding. After some wounds the patient may go into shock (p. 220.)

GENERAL PRINCIPLES OF THE TREATMENT OF WOUNDS.

From what has been said concerning the action of bacteria on wounds, it is evident that great care must be exercised in handling or dressing these injuries to prevent the introduction of living germs.

INFECTED WOUNDS.

A wound that contains bacteria is said to be an *infected* wound. Attempts to destroy the bacteria in a wound is known as *disinfecting* it. Many wounds are infected at the time they are received, because the knife or other instrument has bacteria on it and these were left in the flesh (fig. 141). There are other sources of infecting open wounds such as the hands or instruments used in treating them and the dressings which are applied. As our hands and the ordinary materials like muslin or gauze which might be used for dressings always contain numerous germs, before handling or treating a wound it is necessary to take certain precautions to kill the bacteria on everything which is going to be used about the injury, and also to prepare or to use a specially prepared dressing. Even after these preparations have been made, great care must be exercised to see that the hands or dressing do not come in contact with some object which has not been so treated and new germs be thus picked up.

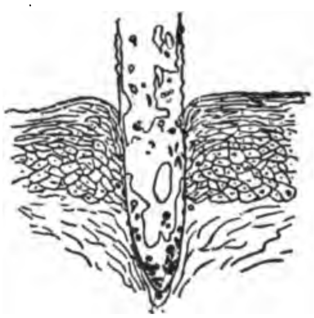


FIG. 141.—Bacteria being introduced into a wound on a needle. (From Richie's Primer of Sanitation, Courtesy World Book Company.)

Sterilization.—The best way to kill bacteria is with heat. All dressings, instruments, and other substances which are used in wound dressing are therefore first heated, generally by boiling water or steam, and are then said to be *sterile.* The process of killing bacteria is known as *sterilization.* It is impracticable, of course, to steam the hands of the doctor or dresser, so special means must be used to free these of living germs before dressing or handling a wound, if it is possible to do so.

Preparation or sterilization of the hands.—The hands should be thoroughly scrubbed for five minutes with a nail brush, hot water and soap. Then the fingernails should be cut short and the spaces under the nails thoroughly cleaned out, after which the hands and nails are again scrubbed for five minutes. After the second scrubbing the hands should be rinsed in clean water and soaked for

several minutes in a solution of one to two thousand of bichloride of mercury, a 3 per cent solution of compound cresol, or a mixture of 2 parts of grain alcohol with 1 of water. These chemicals are used in order to kill the few germs which may have escaped the scrubbing process, but the thorough rubbing and soaking is of more importance than the use of the special solutions. After preparing the hands in this manner they must not be wiped on an ordinary towel, even though it is clean, because the towel will probably contain bacteria and undo to a certain extent the preceding processes.

After the hands have been sterilized in the above manner great care must be taken not to touch any object which has not been previously boiled or steamed. An assistant should remove any bandages and the top dressings, and be at hand in order to give any assistance which will be required so that it will not be necessary for the operator to touch anything but the boiled instruments, sterile dressings, or the wound itself.

On account of the nails and the various cracks and crevices around the hands it is very difficult to sterilize them completely by any process. Hence, in recent years surgeons have been wearing rubber gloves to a great extent when operating or dressing wounds. Such gloves can be boiled and rendered perfectly free from germs. It is always advisable, however, before putting on the gloves, to wash the hands as thoroughly as possibly, because during the operation the glove may be torn and bacteria introduced from the hands into the wound through the hole in the glove.

Metallic objects, like instruments, basins, or pans, are sterilized by boiling in water for 10 or 20 minutes. The hot water should be poured off without touching the instruments and they should be allowed to remain in the pan and the pan carried to the bedside. If it becomes necessary to lay down the instrument, it should be placed in the pan again, and not on a table or similar place, as in this way it can be kept sterile. In doing home dressings, it is an excellent plan to place a little water in several clean agate basins or pans, put on the covers, and place them on the stove and allow to boil for 10 minutes. The hot water can be thrown out and the inside of the pans will be sterile and afford a safe place in which to deposit sterile dressings or instruments while the wound is receiving attention.

Sterile dressings.—Whenever possible, all dressings which are to be used on wounds should have been previously treated with heat so as to kill the bacteria. Materials prepared in this way are called *sterile dressings.* This means that there are no living bacteria on them. Usually sterilized dressings are carefully wrapped up in paraffined paper, sealed in jars, or otherwise protected so that they will remain free from germs as long as the covering is intact. After such a package has been opened and the contents handled, it is no

longer sterile because a few bacteria will certainly be deposited on the dressing by such handling. Sterile gauze for dressings, properly sealed in various size packages can be obtained at most drug stores. One firm at the present time is putting up such gauze in pieces half a yard square, and each piece separately sealed in a paraffined envelope. This method of preparing gauze is a very excellent one for home use, as there is no danger in infecting the rest of the supply when taking out a piece for a wound dressing.

Prepared gauze impregnated with various medicinal substances such as bichloride of mercury, carbolic acid, etc., is often used on wounds. This is known as antiseptic gauze.

Unless the hands have been carefully prepared previously, great care must be exercised in opening and handling sterile dressings. Such dressings should be taken out of the jar or package by touching them on one corner only (fig. 142). They should not be allowed to touch any other object before they are placed on the wound, and the dressing should be so applied that the part which has come in contact with the fingers does not come in direct opposition with the broken skin.

When time is available and no regular sterilized dressings are at hand, ordinary muslin or similar material can be sterilized in the following manner:

The muslin or gauze should be cut of sufficient size and properly folded to the correct size and shape so that it is all ready to be laid on the wound. Then it should be placed in a clean saucepan and a little water poured over it. The saucepan should be tightly covered and the dressing boiled for 20 minutes. The excess water should be poured off by inverting the saucepan and lifting the lid a little. Then the pan can be turned right side up again, the lid removed, and the dressing dried out in the oven, or with care on the top of the stove. It will do no harm if it is slightly scorched, but it should be dry and cool before being applied. Dressings can also be sterilized by baking them thoroughly in a hot oven. They should be placed in a pan so that the dressings can be removed from the oven without touching them directly.

When regularly sterilized dressings are not available one should use material which is as free from germs as possible, such as freshly laundered handkerchiefs, old linen, towels, etc., which have not been used. The process of laundering and the heating and ironing will kill a great many of the microorganisms which are found on such materials, but of course they are constantly collecting new bacteria on account of the handling which they must undergo. However, in an emergency such freshly laundered dressings are very much better than the soiled rags or cloths which are very often placed on wounds.

Germicides and antiseptics.—Chemicals which will kill bacteria

Fig. 147.—Wound of the forefinger, step three. Sterile dressing applied to the finger.

Fig. 148.—Method of removing boiled dressing from a pan.

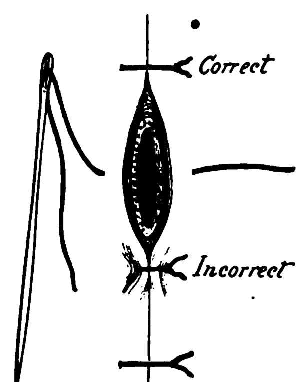


Fig. 149.—Method of sewing up a wound. (From Da Costa's Surgery. Courtesy W. B. Saunders Co.)

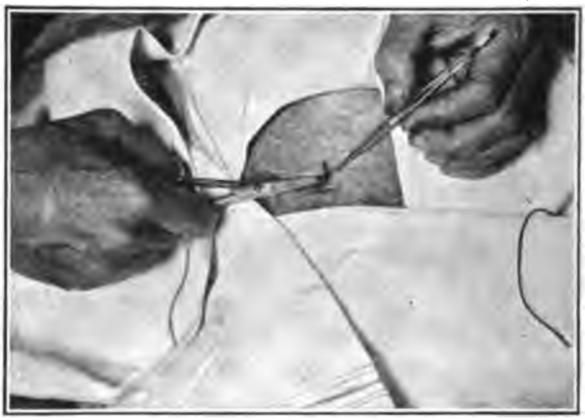


FIG. 150.—Method of removing stitch.

FIG. 151.—Wet dressing for inflamed wound of the hand. Note that the dressing extends to the armpit; also hot-water bottle, and protection to the bed by oilcloth.

are called germicides. Tincture of iodine and carbolic acid are good germicides. The attempts to kill germs by heat or chemicals is known as *disinfection.* Certain substances, while they are not able to kill bacteria to any great extent, can prevent them from growing, and such chemicals are known as antiseptics. A solution of boric acid is a good illustration of an antiseptic.

Boric acid.—Boric acid is a white powder which is extensively used in medicine. A saturated solution is made by stirring a heaping tablespoonful of the powder into a pint of hot water. This solution is soothing and cooling to the tissues and is often used to irrigate dirty wounds, to wash out the eyes, as a mouth wash, and also on compresses to apply to burns and inflamed wounds. Boric acid in solution is nonirritating to the tissues, prevents the development of bacteria, and is not poisonous. Boric-acid ointment is an excellent application for burns and abrasions. It is prepared according to the following formula.

Boric acid in fine powder, 1 part; paraffin, 1 part; white petrolatum, 8 parts. Melt the paraffin, add the white petrolatum, and heat gently for 10 minutes. Then gradually add the hot liquid to the boric acid in a warm pan and stir the mixture thoroughly until it hardens.

In an emergency a fair substitute can be improvised by thoroughly mixing 1 part of boric acid powder with 10 parts of vaseline or petroleum molle.

DISINFECTION OF WOUNDS.

It was formerly the custom to attempt to destroy any bacteria which might have gotten into a wound at the time of the accident by washing the injury with solutions of carbolic acid, bichloride of mercury, hydrogen peroxide, or similar substances. It has been demonstrated, however, that it is practically impossible to kill all the germs in this way and that if the solutions are of sufficient strength to kill the germs that they will do harm to the tissues. In first-aid work wounds therefore should not be irrigated with such solutions unless they are very badly soiled with dirt or if it is necessary to wash out a number of small foreign particles. If the wound is reasonably clean it is much better to simply apply tincture of iodine. This is done by taking a clean match or toothpick, twisting a small amount of cotton around the end to make a swab (fig. 144), dipping the swab in the iodine, and applying a light coat first to the wound and then to the surrounding skin. The iodine will destroy most of the germs and do no harm to the tissues. Experience has shown that in first-aid work wounds which have been treated with iodine in this way do better than those which have been washed out with watery solutions. If the skin of the hand, foot, or part which

happens to be injured is very dirty, it is permissible to dampen a cloth slightly with soap and water or gasoline and to wipe off as much of the dirt as possible from the skin some distance away from the wound, being careful, however, to avoid touching the wound itself or the area immediately adjoining it. Under no circumstances should ordinary water be put into a wound, nor should the cleansing cloth be sufficiently wet to permit the chance of any of the cleansing fluid running into the wound. After the tincture of iodine has been applied the wound should be dressed and the dressing held in place with a bandage or other appliance.

Tincture of iodine is sometimes used just as it comes from the drug store, but it is very much better to dilute it. When buying tincture of iodine for application on wounds it is advisable to always have the druggist add an equal amount of grain alcohol to the regular preparation, making a half-strength tincture. This diluted solution is very efficient for killing bacteria and is not so likely to irritate the skin as the full strength. The weaker solution should be always used for applying to wounds when available. It is also wise to allow the alcohol to evaporate for a few moments before applying the permanent dressing.

Wet dressings should not be placed on skin which has been recently painted with tincture of iodine, as irritation is likely to result. Iodine may be removed by washing with alcohol. The irritating action of too much iodine on the skin can be checked by applying thin, cooked starch paste.

WOUNDS WHICH ARE SOILED WITH DIRT, SAND, OR FOREIGN BODIES.

Reference has already been made to the fact that it is undesirable to wash wounds out with solutions unless absolutely necessary. When dirt and other substances have gotten into the injury, however, it is necessary to remove them and we must take the lesser of two evils and apply solutions. Large particles of dirt may be picked out with a forceps which has been boiled, or with the fingers which have been specially washed and sterilized as described on page 184.

In an emergency, if it is necessary to place the hands in the wound without washing, they should be covered with several thicknesses of sterile gauze as this will assist in preventing infection of the wound. After picking out the gross particles the dirt may be removed by flushing the wound with a suitable solution and scrubbing with pieces of sterile gauze. For this purpose use freshly boiled and cooled boric-acid solution made by stirring a heaping tablespoonful of powdered boric acid into a pint of hot water, or a 1 to 5,000 bichloride of mercury solution, or a 3 per cent compound cresol solution. Pieces of gauze may be boiled in the solution and used as swabs. These solu-

tions should be poured into the wound from the pan in which they have been prepared. If dry sterile gauze is available the interior of the wound should be dried as well as possible after the dirt has been removed. It is well to allow it to remain exposed to the air for a short period to further the drying process. Be careful about disturbing blood clots in wounds because this may start bleeding afresh.

HYDROGEN PEROXIDE.

The practice of applying hydrogen peroxide to fresh wounds is not recommended as a routine practice. It causes a great deal of pain, wets the wound, and is not an efficient germicide. Hydrogen peroxide may be used sometimes to check hemorrhage or to clean up an old leg ulcer, but it should not be applied to other wounds except on advice of a physician.

DRESSING AND TREATMENT OF WOUNDS.

As soon as a wound has been received the first procedure is to determine whether it will be necessary to take active steps to check hemorrhage (p. 205). The clothing should be removed or rolled out of the way so as to give a good view of the injury. In the great majority of cases the bleeding will be slight and will cease spontaneously in a few moments. If the wound is more than a slight cut, a doctor should be summoned. Pending the arrival of the physician, the wound is left alone, nothing being done except to keep the patient still unless it is necessary to check hemorrhage. The patient should rest in a comfortable position and be kept quiet so that the clothing does not rub over the injury, thus introducing bacteria. The wound may be freely exposed to the air without risk for an hour or two, provided nothing is allowed to touch it.

If it will be a long time before medical help arrives, the wound should be covered with several thicknesses of sterile gauze or as clean material as can be obtained in order to protect it from accidental contact with the clothing or other objects. If the patient has to be taken a considerable distance, a regular dressing should be applied and fastened in place with a suitable bandage.

Dressing of wounds.—The best dressing for a wound is sterile gauze. Four or more thicknesses of the gauze should be used, depending upon the extent of the injury and the amount of oozing. The gauze should be folded into such a shape as to cover the wound completely and extend for some distance over the sides. It is much better to have the dressing too large than too small. The purpose of the dressing is to protect the wound and to keep out germs. In large wounds a layer of sterile absorbent cotton is generally placed over the gauze. This can be omitted in small wounds.

Never put cotton directly next to a wound. The blood and discharges will harden in the cotton and cement it fast so that the wound may be torn open when it is necessary to remove the covering.

The dressing must be held in place by some method, and this is generally done by a bandage. The bandage need not be sterile if the wound has been properly dressed. For instructions concerning bandages and their application see page 222. The dressing on an ordinary wound should be left on for at least four or five days, if it feels comfortable and no pain or throbbing develops in the injury. If the bandage becomes loose, it should be replaced without disturbing the dressing. If pain develops in the wound and it begins to throb, the dressing should be removed and the wound examined. It has probably become inflamed and will require special treatment. For the treatment of inflamed wounds see page 194.

FIRST-AID PACKETS.

Small packages properly sealed and protected containing sterile materials for dressing a wound are carried by all soldiers and are often kept on hand for emergencies in factories, on trains, etc. Various kinds of first-aid packets are on the market, but an excellent one is supplied by the American Red Cross. The American Red Cross Textbook on First Aid describes the Red Cross first-aid outfit as follows:

> In each of these outfits is found a long gauze bandage, with a compress of gauze sewn to it in the center, a triangular bandage printed so as to show how to apply it, and two safety pins.
>
> The directions, which are also found inside the case, are as follows:
>
> "GAUZE BANDAGE WITH COMPRESS.—If there is a wound or any injury in which the skin is broken, this bandage and compress are used by unfolding the bandage, being careful not to touch the inner surface of the compress. The compress should then be placed directly on the wound or injury, and held in place by wrapping the ends of the bandage around the limb in opposite directions and tying them or pinning them in place. With a very large wound which the compress will not cover, apply it to the middle of the wound and wrap the bandage around as before. In this case be careful not to touch any surface of the bandage which is placed on the wound. In case there is no wound, this bandage may be used like an ordinary bandage to hold splints in place, etc."

Such packets are useful for soldiers and travelers, but every home should contain at least a small supply of sterile materials suitable for dressing burns and cuts. The following are suggested as most important:

Five yards of sterile gauze, in half yard packets, if obtainable.

One-fourth pound of sterile cotton.

One dozen assorted sterile gauze bandages—from 1 inch to 3 inches.

One-fourth pound of vaseline. Petroleum molle is just as good and generally much cheaper.

One ounce of tincture of iodine (half strength) in a glass-stoppered bottle.

One-fourth pound of boric acid.

FURTHER TREATMENT OF WOUNDS.

Small cuts.—Bleeding is beneficial as it serves to wash out bacteria. After hemorrhage has ceased, paint the wound and the surrounding skin for a considerable distance with a light coat of iodine as above described. Apply a dressing of sterile gauze or freshly laundered muslin and hold in place with a bandage. A sterile gauze bandage makes a convenient dressing for small injuries around the fingers or hand. A piece of the bandage may be folded into a compress, or the bandage alone simply wrapped around the finger, care being exercised so that the part which goes next to the wound is not touched by the operator.

Large cuts.—These are apt to bleed freely, but unless an artery or large vein has been opened, the hemorrhage will in most cases cease of itself.

First-aid treatment.—Send for a doctor. If the blood comes in spurts apply a tourniquet. For the treatment of hemorrhage, see page 205. While waiting for the physician make the patient comfortable and see that the clothing does not come in contact with the wound. If the patient has to be transported before medical help can be obtained, cover the wound with a number of thicknesses of sterile gauze, boiled dry muslin, or similar material. If these are unobtainable, use some freshly laundered article such as a clean handkerchief, towel, or napkin. Hold the dressings in place with a bandage.

Treatment when no doctor will be available.—After bleeding has ceased, apply a light coat of tincture of iodine to the wound and surrounding skin with a cotton swab. Dress with sterile gauze or similar material as directed above.

In an ordinary wound no effort should be made to remove the clotted blood from the wound and the skin immediately around it. The blood is aseptic and when dry makes an excellent protection for the tissues. The dressing should be applied over this material without disturbing it.

LACERATED WOUNDS.

Most of these wounds are infected with bacteria at the time the injury is received, but severe bleeding is rare.

First-aid treatment.—Check hemorrhage if necessary. Send for a doctor. Cover the wound with a sterile dressing making no attempt to disinfect it. While awaiting the arrival of the physician, make the patient as comfortable as possible and treat shock, if it is present (p. 220). If no sterile dressing is available, leave the part exposed to the air but take care that nothing touches the wound. Treat crushes of the hand, arm, foot, or leg in the same manner.

If the patient has to be transported, wrap the part in sterile gauze or other sterile material, hold the dressing in place with a bandage. and place the injured member on a pillow. Do not attempt to move the patient until the symptoms of shock have disappeared.

After treatment.—Small lacerated wounds may be given a light coat of tincture of iodine and also the skin for a considerable area around them. Then apply a dressing of sterile gauze. It is not necessary to put any medicinal substance on fresh wounds to make them heal. If bacteria are kept out of the injuries, they will heal quickly enough.

Large lacerated wounds are treated according to the general principles which have been laid down.

Foreign bodies are removed by a boiled forceps or the fingers after special preparation of the hands. If much dirt has been ground into the tissues, it will be necessary to wash the wound out with freshly boiled boric-acid solution (p. 188), 1 to 5,000 bichloride of mercury solution, or boiled salt solution made by adding a teaspoonful of salt to each quart of water. After cleansing the wound, dry it if dry sterile gauze is available and apply a dry sterile dressing and hold the dressing in place with a suitable bandage.

Crushes of the extremities are laid on a pillow. The part is gently molded in its natural shape. Small wounds are painted with tincture of iodine. Large dirty wounds are cleaned out with antiseptic solutions. The wounds are dressed. After swelling has subsided, suitable splints are applied if fractures are present.

Lacerated wounds in which the tissues have been badly or extensively damaged are almost certain to become inflamed. When inflamtation sets in, treat according to the general rules for inflamed wounds (p. 194).

The Carrel-Dakin solution.—Many of the severely lacerated wounds, due to shell injuries in modern warfare, have been recently successfully treated by intermittent irrigation with a mild antiseptic fluid called the Carrel-Dakin solution.

The skin around the injury is protected with vaseline and a number of perforated rubber tubes attached to a reservoir are inserted to the bottom of the wound so that the fluid will reach all parts of the injury. The tubes in the wound are loosely surrounded with gauze. Sufficient of the solution is run through the tubes every two hours to wet the gauze thoroughly, but no more. This method has given excellent results in trained hands, but its proper application is too complicated for the layman.

Dakin has recently suggested the use of dichloramin-T in solutions of chlorinated oil to obviate some of the difficulties of the Carrel method. The use of this remedy is simple, as the oily fluid is merely sprayed once a day onto the wound with an atomizer and then a fresh

dressing applied. Some very favorable reports have been already made on treating wounds with this solution. It is hoped that they will be verified by more extended research, as its simplicity would highly recommend it for use by the layman in emergencies.

PUNCTURED WOUNDS.

As has already been stated, punctured wounds are especially dangerous because bacteria may be carried deeply into the tissues where conditions are very suitable for their growth. Lockjaw not infrequently developes from such injuries. Always examine the article which inflicted the injury to determine if the end may have been broken off in the wound.

Treatment.—An effort should be made to disinfect the wound with tincture of iodine. Take a toothpick and twist a small amount of cotton around one end. Dip it in the iodine. Then push it down to the bottom of the wound and work the iodine thoroughly into the tissues. Paint the surface with tincture of iodine and apply a sterile dressing. All these patients should be taken to a doctor to have him determine whether injections of antitetanic serum are necessary to prevent lockjaw. (See Tetanus, p. 196.)

SEWING UP A WOUND.

The layman should never attempt to sew up a wound if a physician is within reach. However, on shipboard or in other isolated places, it may be absolutely necessary for an untrained person to attempt this operation if the wound is large or gaps freely. It is better not to sew up a very deep wound unless it is long and the edges gap very widely. The edges of a great many large wounds can be brought together and held in place by suitable compresses and bandages. In sewing up a wound all the instruments, needles, thread, etc., should be boiled immediately before the operation. Prepare several stout needles, a pair of scissors, a probe or a hairpin, and a thimble, also an extra pan or basin in which to place sterile dressings or other instruments if occasion arises. Take heavy thread which will go through the eyes of the needles and cut it in lengths about 12 inches long. All these materials, as has been said before, are boiled and left in the pan in which they have been prepared. The hands are carefully sterilized as described on page 184. The wound, if clean, is swabbed with tincture of iodine, also the surrounding skin. If the wound is dirty it is cleaned out with boric acid solution or bichloride of mercury, 1 to 5,000, as previously described. The threaded needle is inserted into the flesh about one-quarter of an inch from the edge of the wound and pushed through so that it emerges at the bottom, including a good bite of the tissues in its course. It is then reinserted in the bottom of the wound and made to emerge on the oppo-

site side about one-quarter of an inch from the edge of the incision. The thread is cut off leaving enough material so that it can be tied. The stitches are placed about one-half an inch apart and are tied with just sufficient tension to bring the edges of the wound together and yet not exert pressure (fig. —). Use too few stitches rather than too many. After tying, the ends are cut off leaving about one-half an inch from the knot. If the edges of the skin tend to turn in when the stitches are being tied they should be lifted up and placed in proper position with the probe or hairpin. It is necessary for the raw edges to be accurately approximated if good healing is to be secured without a scar. If the wound has been lacerated or has contained dirt, make a wick by twisting 10 or more strands of thread, depending upon the size of the injury, lightly together, and lay it in the bottom of the wound at the lower end, allowing about an inch of the wick to extend over the side in order to provide drainage. This wick is removed on the second day if no symptoms of inflammation have appeared.

The thread used for sewing wounds may be either cotton, silk, or linen. Considerable difficulty may be experienced in pushing the needle through the skin, which is quite tough, and a thimble will be of material assistance in this part of the operation. After sewing up a wound it is well to paint it and the surrounding skin for a wide area with a coat of tincture of iodine, half strength.

Remove the stitches at the end of five days. Use boiled instruments and sterile hands when removing the stitches. Cut the stitch on one side of the knot, and remove by pulling on the knot end (fig. 150).

INFLAMED WOUNDS.

Symptoms.—Sometimes after a wound has been received and dressed all goes well for a day or two and then the wound becomes painful and begins to throb. If the wound is extensive, the patient has fever, the tongue is coated, and there is considerable constitutional disturbance. This condition is known as surgical fever and is due to the absorption of the poisons which are produced in the wound by the pus-producing bacteria. In such cases a physician should be called at once. If no physician is available the dressing should be removed and the wound inspected. The edges will probably be swollen, dry, and stuck together and there will be a diffuse redness of the skin surrounding the injury. It will be necessary to open the wound sufficiently to allow the matter which is forming within to escape. This can be done by boiling a probe, a hair pin, or some small blunt instrument, and then gently inserting it between the edges of the wound and opening them slightly. If the edges are not stuck together and fluid is escaping from the wound, do not attempt to open

it any more. Wet dressings should now be applied. These should consist of from 4 to 12 layers of gauze, depending upon the size of the injury, which are wet in a freshly prepared boiled solution of boric acid. Make the solution by boiling a pint of water in a clean saucepan and then stirring into it a heaping tablespoonful of boric-acid powder. Stir it until it dissolves and permit it to cool. Wet the gauze in this solution and lay it on the wound. Cover the dressing with a piece of oiled paper and renew the solution every four hours. A wet dressing should be thick and large enough to cover a considerable area around the injury. It should be kept wet by pouring a little more of the boric-acid solution under the oiled paper every three or four hours, day and night, if the symptoms are serious.

Further treatment.—In a great majority of inflamed wounds as soon as the matter begins to escape freely from the wound the signs of inflammation gradually subside. Such wounds should be washed out at least once a day with a freshly boiled and cooled solution of boric acid as above described, or a 1 to 5,000 solution of bichloride of mercury, or if these are unavailable, a solution made of one teaspoonful of common salt to a pint of boiled water. Wet dressings should be continued for four or five days. After the pus begins to flow freely care should be taken that the edges of the wound do not grow together too soon, which will dam up the pus and cause the wound to become inflamed again. To insure the wound keeping open the edges should be gently separated every day with a probe or hair pin which has been boiled. The dressing should be changed as frequently as they become soiled with the escaping matter. Wounds which are discharging pus freely are known as suppurating wounds. Such wounds at times refuse to heal and become indolent. Indolent wounds may be irrigated with a solution made by adding enough tincture of iodine to boiled water to make it a port-wine color.

Inflamed wound of the hand.—It sometimes happens that slight injuries of the fingers or hands are followed by signs of rapidly spreading inflammation. The injured finger swells first, then the hand and forearm; the skin is red; painful kernels form under the armpit; red lines may extend up the arm; and the patient feels feverish and sick. There is also pain and throbbing in the part. The treatment for such cases is to open the wound freely with a sterile knife or probe and to wrap the whole hand and arm with several thicknesses of turkish toweling which has been wet in the boric-acid solution above referred to (fig. 151). The addition of one part of alcohol to four parts of the solution is helpful. In the absence of boric acid use plain water, adding 20 per cent of alcohol, if it is available. Put the patient in bed, lay the arm on a pillow, keeping the dressing constantly wet day and night, and keep it warm by surrounding it with hot-water bottles. In such cases every possible effort should be made

to obtain a doctor at once, for the condition is very serious and may terminate fatally unless promptly controlled. Continue this treatment until the symptoms subside or medical help is obtained.

In the meantime the patient's strength should be supported by a light and nutritious diet, giving eggs and milk freely if they are obtainable. At the onset of the symptoms a purgative should be administered and the bowels should be kept open daily during the attack. Rest of the part is extremely important when inflammation starts in a wound. If the finger or hand is involved, put the arm in a sling. If the arm is affected, put the patient in bed and lay the arm on a pillow. Rest in bed is required if the wound is in the foot or any part of the lower extremity. *Never dress a wound with compresses wet with a solution of carbolic acid, as gangrene is apt to follow.*

INFLAMED LEG ULCERS.

Treatment.—If a leg ulcer becomes inflamed the patient should be put in bed and the foot elevated. Wet compresses of boric-acid solution or of salt solution, made by adding a teaspoonful of salt to a pint of water, should be applied for three or four days until the inflammation subsides. Then the ulcer may be dressed with oxide of zinc ointment or boric acid ointment. Rest in bed with elevation of the leg is very beneficial in the treatment of all leg ulcers.

TETANUS OR LOCKJAW.

Description.—Tetanus is a dangerous disease due to a particular kind of a germ which is introduced into the body by some sort of an injury, frequently a slight wound.

Symptoms.—The symptoms of tetanus are varied, but one of the most characteristic points is a stiffness of the neck and the lower jaw. Later on spasms of other parts of the body develop. The disease is extremely fatal, the mortality ranging somewhere between 50 and 85 per cent. The germ which causes tetanus (fig. 152) is found especially in garden soil, in street dirt, and the dust around stables. It can not grow in the presence of air, hence lockjaw is apt to develop after deep punctured wounds, especially those due to nails or farming implements, and also in lacerated wounds into which street dust or soil has been forcibly ground. Tetanus has always been prevalent among the wounded in armies, but especially so in the early part of the present European war. This was probably due to the fact that the troops were fighting in trenches and soil and dirt, or pieces of soiled clothing were frequently forced into their wounds. Tetanus often follows Fourth of July injuries, especially wounds from toy pistols. A large number of cases were formerly reported every year in the United States after the celebration of the Fourth.

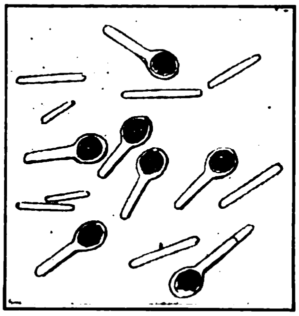


FIG. 152.—Bacilli which cause lockjaw. (From Richie's Primer of Sanitation. Courtesy World Book Co.)

FIG. 153.—Sewing up a scalp wound. (From Mumford's Surgery. Courtesy W. B. Saunders Co.)

FIG. 154.—Tourniquet for a snake bite. The band near the wrist is the tourniquet. The upper band holds the lever in place.

FIG. 155.—Showing how much space should be left in tying a knot for a tourniquet.

Fig. 156.—Dog with rabies. Dumb rabies. First day. Dropping of jaw. Drooling. Eyes glassy and apprehensive. (U. S. Public Health Service.)

Fig. 157.—Dog with rabies. Dumb rabies. Second day. Paralysis of lower jaw. Drooling. Dull, depressed, and awkward. (U. S. Public Health Service.)

Fig. 158.—Dog with rabies. Dumb rabies. Fourth day. Jaw paralysis. Drooling. Complete posterior paralysis. (U. S. Public Health Service.)

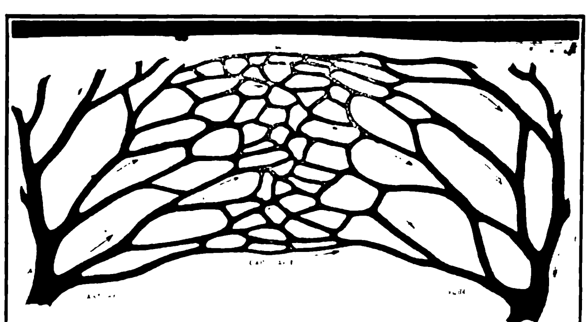


Fig. 160.—Arteries, capillaries, and veins. (From Richie's Physiology. Courtesy World Book Co.).

Since the introduction of the injection of antitetanic serum after these accidents, the amount of tetanus from this source has greatly decreased. It has also been almost eliminated among the European troops by the same procedure. Horse blankets or other articles which have been used around stables should never be allowed to come in contact with an open wound or a burned surface of the skin.

Treatment.—When a person has received a lacerated wound which has been much soiled by dust or dirt, or a punctured wound from a nail or garden implement, the most important thing is to take the patient to a doctor and have him receive injections of antitetanic serum. This injection should be repeated at intervals of a week, until three doses have been given. The local treatment of punctured and lacerated wounds has already been described. Tetanus usually develops in from 6 to 16 days after the receipt of the injury, but occasionally may not appear for as long a period as three months. Gunshot wounds in which pieces of clothing have been carried into the flesh are apt to be followed by tetanus.

If tetanus does develop on board ship or in some other locality where a doctor can not be obtained, the patient should be placed in a darkened and quiet room. The bowels may be kept open by administering salts or castor oil daily. Give 20 grains of bromide of potassium with 10 grains of chloral every theree hours if necessary to produce quiet and allay pain. If attempts to swallow produce convulsions, the patient may be fed by small injections of beaten-up raw egg or other concentrated food by the rectum.

SPECIAL WOUNDS.

ABRASIONS.

Abrasions are very superficial wounds in which the outer layers of the skin have been rubbed or ground off by dragging the part forcibly over some rough surface.

Symptoms.—Pain and redness. The affected areas are "raw" looking, and tiny drops of blood or serum may appear.

Treatment.—If dirt has been ground into the injury it should be washed off with boric acid solution. If the surface is clean this is not necessary. A coat of diluted tincture of iodine, half strength or less may be applied, but ordinarily this is not necessary, and it is always very painful. Finally, dress with sterile gauze spread with boric acid ointment or oxide of zinc ointment.

BRUSH BURN.

When a rope slides through the closed hands very rapidly a combination of an abrasion and laceration is produced known as a *brush burn*

Treatment.—Apply sterile compresses of boric acid solution for several days. Then dress with sterile gauze spread with boric acid ointment.

SPLINTERS.

Small splinters may be removed from the flesh by means of a needle which has been passed once or twice through a flame and then cooled. Larger splinters may be extracted by passing a knife blade several times through a flame, cooling it, inserting the blade under the splinter and grasping the foreign body between the thumb nail and the knife.

WOUNDS CAUSED BY FISHHOOKS.

When the barbed end of a fishhook has entered the flesh, do not attempt to remove it by pulling it directly out. Such a procedure will cause great laceration and tearing of the tissues. The better plan is to depress the shank of the hook, push the point forward and onward in an upward direction, and bring it out on the surface at another point. The barbed end is then cut off with a wire cutter or file. The barbed end having been removed, the hook can be extracted by pulling on the shank without damage to the tissues.

BULLET WOUNDS.

Bullets make small, deep wounds which are generally classified as punctured wounds.

First-aid treatment.—Send for a doctor. If sterile gauze is available, cover the wound with that. Remember that there may be two wounds, one where the bullet went in, the other where it came out. If only one opening is seen, search for the other on the opposite side of the limb or body. Treat shock, if present.

After treatment.—If pieces of clothing have been carried into the wound and can be readily seen, remove them with a sterile instrument. Do not probe for the bullet. Swab the wound or wounds and surrounding skin with tincture of iodine and then apply a dressing of sterile gauze or other sterile material. Keep the injured part at rest.

If a bone has been broken by the ball, treat as a compound fracture.

As soon as possible take patient to doctor for injections of antitetanic serum. All persons injured by firearms should receive these injections.

PERFORATING WOUNDS OF THE CHEST.

Perforating wounds of the chest are severe injuries and are often followed by grave consequences, the lungs, heart, or large blood vessels often being damaged.

Symptoms.—The wound itself, pain, hemorrhage, and sometimes the entrance and exit of air into the chest which can be detected by a peculiar whistling sound heard at the wound during the act of breathing. The patient may spit up blood, and shock is almost always present.

First-aid treatment.—Send for a doctor immediately. Place the patient in a semireclining position and treat shock if present. Cover the wound with a large pad of sterile gauze.

After treatment.—Put the patient in bed; paint the wound with tincture of iodine; dress with a large compress of sterile gauze; place a tight bandage around the chest; and keep the patient quiet. Great swelling of the chest, neck, and even the face may occur, due to the entrance of air into the tissues, but in favorable cases this will subside spontaneously.

SCALP WOUNDS.

Scalp wounds are common, and often result from a blow on the head with a blunt object, such as a club or a beer bottle, the yielding scalp being caught between the rigid skull and the hard weapon.

First-aid treatment.—Check hemorrhage, if necessary, by laying a compress of sterile gauze on the wound and fastening it tightly with a bandage around the head. In severe cases a tourniquet may be tied around the forehead and head just above the ears. Send for a doctor. Treat shock if present.

After treatment.—Trim the hair close to the scalp for a wide area around the wound. Be very careful that the cut hair does not get into the wound. Paint the wound and surrounding scalp with tincture of iodine. Dress with dry sterile gauze. If the patient keeps disarranging the dressing by tossing the head during sleep, make a muslin cap with strings to tie under the chin. Hold the dressing in place by pinning it to the cap.

If the wound is large and gaps widely, it may be necessary to sew it up. If a doctor is not available and the bleeding can not be controlled by a compress with firm pressure, sewing up the wound will stop it. In sewing up a scalp wound be guided by the directions on page 193. Insert the needle to the bottom of the wound and tie the stitches tightly enough to check the bleeding but no tighter than necessary (fig. 153). Always leave a small drainage wick made of about eight strands of boiled thread in one end of the wound. Remove the drain in 48 hours. Take out the stitches in five days, and sooner if inflammation sets in.

WOUNDS OF THE ABDOMEN.

Shallow wounds of the abdomen are handled like similar injuries in other parts of the body, but deep wounds with escape of the bowels are very serious injuries and require special treatment.

First-aid treatment of wounds of the abdomen with escape of the bowels.—Send for a doctor at once. The bowels should be covered with several thicknesses of sterile gauze wet in boiled and cooled warm salt solution (a teaspoonful of salt to the quart of water). If no sterile gauze is at hand, boil a towel in a salt solution of the above strength, cool it until it is at body temperature, and then lay it over the intestines. Treat shock, which is certain to develop.

After treatment.—When no doctor will be available proceed as follows: Lay the patient on his back. If the wound is in the lower part of the abdomen, raise the hips. Make every effort to avoid getting bacteria on the bowels or into the wound. Sterilize the hands (p. 184). Sterilize some salt soution and cool it to body temperature. Wash the bowel with this. Examine the bowel carefully to see if it has been opened and the contents escaping. If it is apparently sound, endeavor to gently return it into the abdomen, using the hand covered with sterile gauze for this purpose. Push the part which came out last back first. Gradually in this way work the bowel back into the belly.

If the bowel has been opened, leave it on the outside, but dress with sterile gauze wet with salt solution.

POISONED WOUNDS.

Description.—These are wounds into which poison has been injected at the time the injury was received. Snake bites and bee stings are examples of poisoned wounds.

SNAKE BITES.

(After Da Costa.)

Description.—The bites of copperheads, water moccasins, coral snakes, and rattlesnakes are all poisonous. The diamond black rattlesnake is the most dangerous serpent of the United States. The bite from a small snake is not as poisonous as one inflicted by a large snake of the same species. The greater number of snake bites are received on the extremities. The poison fangs of snakes consist of hollow teeth which connect with the poison sac in the upper jaw. When the reptile strikes the teeth are inserted into the flesh, the poison sac is contracted, and the venom forced into the wound. There are two poison fangs, one on each side of the upper jaw. In snakes of the viper species the poison teeth lie along the back of the mouth and are dropped into a vertical position when the animal is ready to attack. Snake venom is a thin greenish-yellow fluid of characteristic odor and extremely poisonous. The mortality from bites of poisonous snakes varies, ranging from 5 per cent in the case of copperheads to about 20 per cent for the large rattlesnakes.

Symptoms.—Intense pain, discolored swelling of the bitten part, which soon becomes very marked, and profound disturbance of the system. The general symptoms develop soon after the bite. They consist of great weakness and prostration, nausea, and a profuse flow of saliva. Paralysis of the muscles occur in from three to four hours. Unconsciousness is rare, but the patient falls into a kind of stupor.

Treatment.—The bite is usually on the lower part of the limb, and a band made of a handkerchief, necktie, or similar article should be instantly applied a few inches about the wound between it and the heart and tightly twisted with a stick (fig. 154) to shut off the circulation to the part and prevent the poison from being carried into the system by the circulating blood. The bites of most venomous serpents consists of but two punctures. These small wounds should be freely incised with a knife and then sucked. There is no danger in sucking the wound if there are no cracks or sores in the mouth or on the tongue. After the wound has been sucked it should be cauterized. This is done by applying carbolic acid or nitric acid on the end of a stick, such as a match stick or toothpick. Most of these injuries happen in the wilds, where such chemicals can not be obtained. Cauterization may then be performed by heating a nail, a knife blade, or some other metallic object, such as a suspender buckle, in a fire and freely burning all parts of the wound. On hunting trips a cartridge may be torn open and a little gunpowder poured on the wound and then ignited with a match. Permanganate of potash has been highly recommended, and is used by injecting a 1 per cent solution into the wound and also into the surrounding tissues by means of a hypodermic syringe. The crystals of permanganate of potash may be rubbed into the wound.

After the wound has been sucked and cauterized so as to extract and destroy as much of the poison as possible, the tourniquet may be loosened. It should be allowed to remain loose for one minute and then tightened up again. Wait 20 minutes and if no alarming symptoms develop it is again released, and this time allowed to remain loose for two minutes, after which it is tightened. Another period of 20 minutes is allowed to elapse, and on this occasion the tourniquet is left off for three minutes. This procedure is continued for several hours, gradually increasing the time the tourniquet is off, and is known as using the intermittent tourniquet, the object being to allow only small quantities of the poison to get into the system at one time.

If in spite of the local measures and the use of the tourniquet general symptoms develop, the patient must be given stimulants. It is commonly believed that large doses of whisky or alcohol in some form should be administered. This is a mistake, as large doses will

do harm by adding another depressant to that which is already in the system.

Instead of whisky it is better to give aromatic spirits of ammonia. one-half teaspoonful in water every hour, and a half a cupful of very strong coffee every two hours.

External heat is sometimes useful. A compress wet with boric-acid solution should be applied to the wound after the cauterization.

Of recent years serums have been produced which are very effective in certain kinds of snake bites, but they are rarely obtainable when most needed.

INSECT STINGS.

BEE STING.

The stings of bees and wasps and yellow jackets are very painful but not dangerous to life unless the victim is attacked by a large number of the insects.

Treatment.—If the sting remains in the flesh it should be pulled out and a drop or two of diluted ammonia water applied to the wound. A compress wet in cold water or cold boric-acid solution will help to allay pain.

STINGS OF CENTIPEDES, TARANTULAS, AND SCORPIONS.

The stings of these insects are very much more severe than those of wasps or bees and may cause considerable general weakness, headache, sweating, and vomiting, but they are practically never fatal.

Treatment.—The wound should be encouraged to bleed as much as possible and afterwards cauterized with carbolic acid or some other caustic if available. Tincture of iodine may be applied. An ice compress should be placed over the wound to limit local reaction. General symptoms, such as prostration and headache, should be treated by moderate stimulation, giving aromatic spirits of ammonia, 30 drops in water every hour and supplementing this with half a cupful of very strong black coffee if necessary. Some authorities recommend the application of a constricting band, which is gradually loosened in order to prevent the poison from being taken up by the system rapidly.

DOG BITES.

Dog bites are usually minor lacerated wounds, but are especially dreaded on account of the danger of hydrophobia, which is almost invariably fatal.

Treatment of dog bites.—If a person is bitten by a healthy dog, the wound should be thoroughly swabbed with iodine, working the medicine well into all parts of the wounded flesh with a small swab of cotton on a clean toothpick and the wound treated in other re-

spects as an ordinary lacerated wound. If the dog is sick, he should be confined and carefully watched. If he remains well for 14 days, there is little danger of hydrophobia developing in the patient. In no case should the dog be killed unless it is certain he is rabid, as in this way it will be impossible to tell whether or not he had rabies unless the head is sent to a laboratory for examination. If the dog has hydrophobia or is suspected of having hydrophobia at the time the injury is recived, the wound should be thoroughly cauterized with pure nitric acid on a glass rod or the end of a match stick in the same manner as directed for the tincture of iodine. The acid should be worked thoroughly into all parts of the wound, and the point of a glass medicine dropper makes an excellent instrument for this purpose. Care should be taken not to get the acid on the sound skin. Carbolic acid, followed by alcohol, may be used for the same purpose, but is not as efficient. This cauterization should, of course, be done by a physician if one is available. After the cauterization the patient should receive the Pasteur treatment, which consists of a series of injections covering a period of some weeks.

SYMPTOMS OF HYDROPHOBIA OR RABIES IN A DOG.

It is advisable that the public should know something about the symptoms of hydrophobia in animals. A dog which is developing the disease may show hardly any symptoms except weakness. Usually, however, the animal shows a marked change in disposition, refuses his food, is apprehensive and very restless. He is liable to run away from home, snap at anything in his way, and swallows sticks, stones, and other strange objects. Later on paraylsis develops in the lower jaw. The jaw hangs down and saliva drools from the mouth. In the last stages the hind legs become paralyzed and the dog drags them. One should be especially careful about attempting to relieve a dog who apparently has some foreign object in the throat, the symptoms being that the jaw hangs down and saliva runs from the mouth. Such animals are very apt to be rabid, and if the hand is inserted into the mouth in an attempt to remove the supposed foreign body, the person may be bitten or injured accidentally by the teeth and infected with the disease. Hydrophobia usually does not develop within less than 10 days after the person is bitten, three weeks being about the average period. In rare instances the disease has appeared many months after the receipt of the injury. If the dog is suspected of being mad and has been killed after biting some one, the head should be cut off, packed in ice, and sent by express to the nearest laboratory for examination. Usually such laboratories are maintained by State health departments at the State capital.

Other animals besides dogs contract the disease, especially wolves, and occasionally cattle develop it.

BITES OF CATS AND OTHER SMALL ANIMALS.

These injuries are usually punctured and slightly lacerated wounds. The proper treatment is the application of tincture of iodine thoroughly worked into the wound, followed by a sterile dressing.

MOSQUITO AND FLEA BITES.

Treatment.—The itching and irritation from these bites can be relieved by a lotion of carbolic acid and boric acid. It should be applied by dabbing on with a small wad of cotton, or better still by spraying it on the surface with an atomizer. To make the lotion, add a level tablespoonful of boric acid powder and 20 drops of pure carbolic acid to a half a pint of hot water. Stir well or shake until the boric acid is dissolved. Cool before using.

HEMORRHAGE OR BLEEDING.

THE CIRCULATORY SYSTEM.

The blood is a fluid which circulates through the body in closed tubes called blood vessels. There are three kinds of blood vessels, the arteries, veins, and capillaries. The blood flows from the heart in the arteries and returns to the heart in the veins. The capillaries are very minute channels which connect the arteries and veins (fig. 160). It is necessary for the blood to be in constant motion in order that food and oxygen may be carried to all parts of the body and waste substances removed.

The heart is situated behind the breast bone, almost in the middle of the chest but slightly to the left side. The function of the heart is to force the blood through the arteries and keep it moving.

The heart beats at the rate of 72 times per minute in a normal person. Excitement, fever, exercise, shock, hemorrhage, and many other conditions cause the heart to beat faster.

As long as the blood is circulated through its proper living channels it remains fluid, but when it escapes from the blood vessels in a short time it hardens and clots. The clotting of the blood forms a firm plug which serves to close the blood vessel and checks bleeding. Exposure to the air and the admixture of foreign substances hastens the formation of the clot. The clotting of the blood when it gets outside of the circulatory system, is a wise provision of nature as otherwise a slight wound would frequently cause death. There are certain individuals whose blood has very slight clotting power. It is very difficult to check bleeding from such persons and they are known as "bleeders."

The blood in the arteries is under considerable pressure due to the action of the heart. The pressure of the blood in the veins is very

slight. It is very much easier to check hemorrhage from a vein than from an artery as the blood rushes from the artery so rapidly that there is no time for the formation of a clot in the vessel. Blood from a cut artery flows in spurts or a fine jet, and it is bright red. Blood from a cut vein flows steadily, does not spurt, and is dark red in color. Blood from cut capillaries flows steadily and is bright red.

ORDINARY BLEEDING.

In most wounds there is simply hemorrhage from the capillaries. The blood is red and flows steadily for a few moments, then the flow becomes slower and finally loss of blood spontaneously ceases. Bleeding, from by far the greater majority of wounds, is of this type. Such slight hemorrhage in reality is beneficial because it serves to wash bacteria out of the tissues if any have been deposited there. If bleeding from ordinary wounds does not cease spontaneously, it can practically always be checked by placing a pad of gauze over the wound and pressing it against the wound either by the hand or a bandage, in the meantime elevating the injury if it is in the arm or leg (fig. 162). Many wounds are on the extremities and this simple expedient of applying pressure and raising the part will be all that is required to control the bleeding in most cases.

Occasionally a wound of this kind begins to bleed a second time after it has been dressed for an hour or two. This may be due to the fluid blood which is in the dressing acting as a poultice on account of the heat of the body. In these cases removing the dressings, elevating the part, and exposing the wound to the cool air, will cause the hemorrhage to stop and a new dry dressing can then be applied.

Reference is frequently made to slight bleeding and severe bleeding, but it may be difficult for the inexperienced to decide just what is meant by these terms, as any loss of blood is disturbing to the patient and the bystanders. In deciding whether or not bleeding should be classed as severe it should always be remembered that even a small quantity of blood will make quite an alarming stain on the linen or clothing, but the important thing is to note the rate at which the blood is actually escaping from the wound itself. The wound should be exposed for this purpose, with the patient sitting or lying quietly in a comfortable position. If the total blood escaping from the wound falls from the part in separate drops, the bleeding can hardly be called severe.

Sometimes a small amount of bleeding will continue for a long time. If the loss of blood is negligible, in such a case it is generally customary to proceed with the dressing, relying upon the pressure of the gauze to ultimately stop the hemorrhage.

76912°—19——16

Anything which makes the heart beat faster will increase hemorrhage, hence it is unwise to give stimulants to bleeding patients unless absolutely necessary to save life, and in all cases they should be kept in a recumbent or semirecumbent position and as quiet as possible.

Do not put styptics, such as Monsel's solution, turpentine, cobwebs, and similar substances in wounds to stop bleeding. Bleeding can be controlled by other methods, and the use of styptics is undesirable as a general rule.

OOZING.

Occasionally considerable oozing will persist from a wound which is possibly not deep but extensive. Such oozing can almost always be controlled by the pressure of a properly applied compress, but if this fails the wound may be irrigated with hydrogen peroxide, which is an excellent means of stopping such loss of blood. In the absence of hydrogen peroxide very cold water or water as hot as can be borne should be tried. Do not, however, use lukewarm water, because it will increase the bleeding instead of diminishing it.

VENOUS HEMORRHAGE.

When a vein has been cut the blood wells up in the wound steadily and is dark red in color, sometimes almost black. If the vein is large, the blood flows rapidly, and a considerable amount may be lost. Such hemorrhage can be stopped by simply pressing a pad of sterile gauze over the wound and then elevating the part, having the patient lie down.

BLEEDING FROM VARICOSE VEINS OF THE LEG.

Occasionally these veins rupture and rather profuse hemorrhage occurs. In such a case the proper treatment is to lay the patient down, raise the leg and foot well in the air, and apply a clean gauze pad or as clean a pad of muslin as can be obtained on the ruptured vein, making light pressure on the compress with a bandage. Be sure to remove all garters or other constricting bands. If the hemorrhage continues in spite of this treatment the effort of loosening that part of the bandage which is between the heart and the wound should be tried. It may be that the bandage is improperly placed and is obstructing the return flow of blood to the heart and increasing the hemorrhage.

PACKING A WOUND TO CHECK HEMORRHAGE.

Where the hemorrhage is of a moderate amount it is always best to try the effect of elevation and pressure first. If these fail and the bleeding continues persistently it may be necessary to resort to pack-

FIG. 161.—Stopping hemorrhage by pressure with a pad of gauze in the hand.

FIG. 162.—Stopping hemorrhage by pressure on a pad of gauze with a bandage.

FIG. 163.—Method of packing a wound. The gauze is being forced into the wound with the point of a closed pair of scissors.

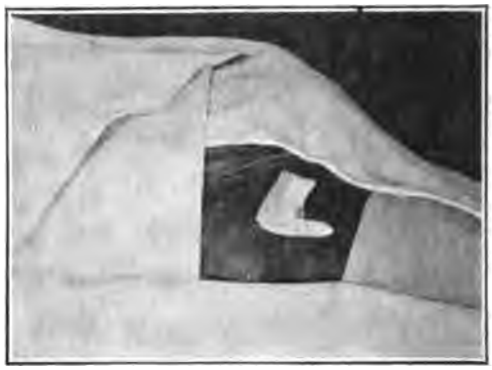


Fig. 164.—Wound packing finished.

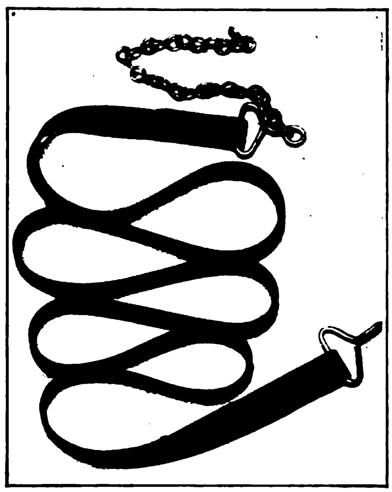


Fig. 165.—Elastic tourniquet.

Fig. 166.—Elastic tourniquet applied

ing the wound. Packing a wound is very similar to stopping a small leak in a boat by forcing a strip of muslin into the opening, and any person of ordinary intelligence can learn how to do it. The procedure is somewhat in the order of a minor surgical operation and should not be undertaken if it can be avoided, as germs may be carried into the wound by the procedure.

RULES FOR PACKING WOUNDS.

1. In first-aid work if a doctor will arrive soon and severe bleeding of an extremity can not be stopped by elevation and the pressure of a pad on the wound, apply a tourniquet (p. 208).
2. If it is certain that medical aid can not be obtained in 4 hours, and the bleeding can not be checked by pressure and elevation of the part and becomes alarming, pack the wound.
3. Packing is also used to control hemorrhage from wounds of the trunk or neck which can not be controlled by pressure. Tourniquets, of course, can not be applied in these localities.

PREPARATION FOR PACKING A WOUND.

Everything which goes into the wound, should be sterile, hence it may be necessary to apply a tourniquet (p. 208) to stop the bleeding while suitable preparations for packing are being made. The tourniquet should be loosened as soon as everything is ready. The bleeding may not recur, in which case packing will not be required. If bleeding of importance starts when the tourniquet is loosened, pack the wound.

Strips of sterile gauze or iodoform gauze make excellent packing material. If these are not at hand, strips of clean muslin may be boiled for 10 minutes, the water poured off and the strips dried as well as possible by continuing to heat them in the pan with the lid off. Be sure there is enough material to fill the wound tightly. The muslin can be boiled at the same time as the instruments but in another pan.

METHOD OF PACKING.

Scrub the hands carefully for 10 minutes in soap and water, changing the water frequently. Then soak them in a 1–2,000 bichloride of mercury solution if available. In the meantime boil in a pan on the stove a pair of scissors, a hairpin, a stick of wood similar to a penholder in size and shape, and a pair of dressing forceps and artery forceps if they are at hand. Pour the water off of the instruments and allow them to cool in the pan without touching them. Dry out the strips of muslin or gauze if it has been necessary to boil them. Place the instruments and the pan of packing material, gauze or muslin, alongside of the patient. Wash the hands again.

Cut the gauze or muslin with the boiled scissors into strips about 18 inches long and narrow enough to go into the wound easily and place these strips back in the pan. Remove the dressing from the wound and work the narrow strips into the wound by means of the closed points of the scissors, the stick or the forceps (fig. 163). A small metallic screw driver makes an excellent packing instrument.

The gauze is pushed firmly into the bottom of the wound first and the wound gradually filled from the bottom up. Considerable pressure must be used to pack the wound effectively. If the wound is somewhat cone-shaped the gauze may be packed firmly into the opening and then held in place by a bandage properly applied. Sterile packing can be allowed to remain undisturbed for 24 to 48 hours. Before starting in to remove it, sterilize the hands and have sterile instruments and materials ready for repacking in case hemorrhage recurs. Have a tourniquet at hand also. Take the packing out slowly and gently. If serious bleeding follows the removal of the packing, apply the tourniquet and repack. If the wound does not bleed, swab with tincture of iodine and dress with sterile gauze.

EMERGENCY PACKING.

Whenever circumstances permit the above procedure should be faithfully carried out before packing a wound. Even in camps or remote districts pans and a fire can generally be obtained and the bleeding controlled by a temporary tourniquet while the necessary articles are being boiled. However, if it is impossible to secure sterile materials, use the cleanest things obtainable. Strips torn from a clean handkerchief, towel, napkin, or the sleeve of a shirt can be forced into a wound with a narrow stick, a buttonhook, a long wire nail, or a pencil. It is better to run the risk of infecting a wound than to allow a man to bleed to death. Such packing, however, should be removed as soon as sterile material can be obtained and the wound repacked if bleeding starts in afresh.

ARTERIAL HEMORRHAGE.

Blood from arteries comes in spurts or a fine jet and is bright red.

Treatment.—Very small bleeding arteries can often be controlled by pressure and slightly larger ones by packing, but as a general rule, if the artery is of any size and in an extremity, it will be best to apply a tourniquet immediately.

TOURNIQUETS.

Tourniquets are appliances used to check hemorrhage by compressing the arteries somewhere between the heart and the wound. It is well known that the flow of water through a soft tube, such as the tubing used on a fountain syringe, can be easily stopped by

FIG. 167.—Inelastic tourniquet applied to main artery of thigh. Note compress over main artery under tourniquet. Stick is prevented from untwisting by necktie above the knee.

FIG. 168.—Emergency tourniquet twisted up by the hand.

FIG. 170.—Compressing main artery in the arm with the thumb.

FIG. 172.—Compression of main artery in the thigh with thumb.

FIG. 173.—The use of two pads to avoid bruising the flesh under the tourniquet and main artery of arm. Pair of shears used as a lever to twist up tourniquet and held in position by handkerchief around the elbow.

FIG. 174.—Spoons bent into retractors for wounds.

FIG. 175.—Artery forceps.

pinching the rubber between the fingers. Hemorrhage from a wound can be controlled in the same manner by pressing the main artery with the fingers or a pad against the bone which lies underneath or by making constriction around the limb by a very tight band.

There are two varieties of tourniquets. In hospitals and on ambulances a strong rubber band about 3 feet long, with chains and

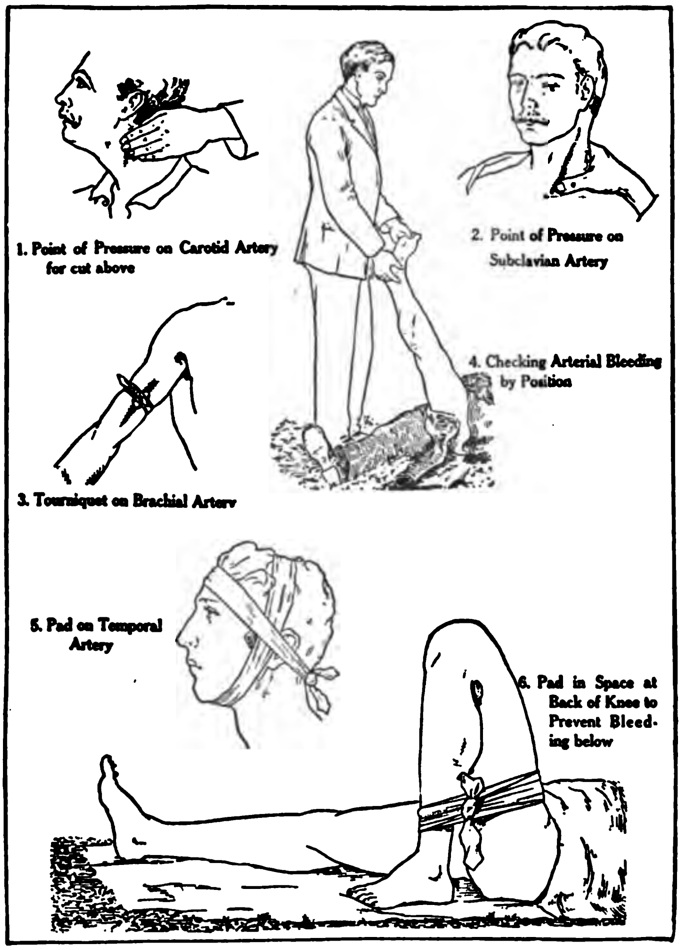


FIG. 159.—Stopping bleeding. (Courtesy of the American Red Cross.)

hooks on the ends for fastening, is generally used for this purpose. This is known as an elastic tourniquet, and is very convenient, because it can be quickly applied by anyone and controls hemorrhage very effectively (fig. 165).

In first-aid work it may be often necessary to improvise a tourniquet. For this purpose a handkerchief, necktie, towel, or any piece of material of sufficient strength, which can be knotted around the

limb and twisted up with a stick, is frequently used. These are known as inelastic tourniquets, and when using them it is advisable, when time and circumstances permit, to place a pad over the main artery so as to make pressure on it directly (fig. 167).

PROVISIONAL TOURNIQUETS.

In an emergency when an artery of considerable size has been opened the helper should immediately take a handkerchief, necktie, towel, or even a wide strip torn from the shirt of the patient, and tie it around the arm or leg which is wounded, placing the knot so that the encircling band is slightly larger than the circumference of the part. Adjust the band so that it is several inches from the wound and between the wound and the heart. Grasp the band firmly in the palm of the hand and turn the hand around, thus tightening and twisting the tourniquet (fig. 168). This will instantly stop the flow of blood and give the helper a chance to collect his wits and decide on his further course of action. He holds the tourniquet thus tightened until a stick, ruler, screw driver, a long pair of scissors, chair rung, or any similar article has been obtained and then slips this instrument into the loop in place of his hand and uses it to twist up the tourniquet. The band is tightened by twisting the stick, or whatever is used as a lever, just enough to stop the bleeding and no more. All tourniquets are very painful, and as great leverage is secured by means of the stick special care must be exercised in tightening them, as serious damage may be inflicted on the nerves and structures beneath by too great pressure. Always watch the wound, and the moment the hemorrhage ceases stop turning the lever. When just the right amount of pressure has been applied, fasten the stick in the proper position by a handkerchief or strip of some material, looped first around it and then passed around the part (fig. 173). The bleeding is now controlled for the present, and further procedure will depend upon how soon medical aid can be obtained.

1. If the accident has happened in a city or town and medical help will certainly be available within an hour, nothing further need be done except to send for a doctor and make the patient as comfortable as possible in the interval. Proper measures should be taken to protect the wound from the entrance of bacteria, as already described.

2. If it will probably require two or three hours to secure a physician, the helper should endeavor to improvise some sort of an elastic tourniquet to replace the nonstretching band which was applied at first. Elastic tourniquets are very much better than the inelastic ones, because they do less damage to the tissues and are less painful. The inner tube of a bicycle tire makes an excellent tourniquet; also a strip about 1 inch wide and 4 or 5 feet long cut from the inner tube of an automobile tire. Practically all automobilists carry these spare tubes.

and it may be possible to obtain one. A couple of pairs of elastic suspenders can be constructed into a tourniquet.

Elastic tourniquets are applied by taking two or three turns fairly snugly around the limb and then gradually pulling harder on the long end until the hemmorrhage stops. The remainder of the tourniquet is then wound around over the original turns, stretching it sufficiently so that the proper amount of pressure is maintained. The ends are then tied or twisted together and prevented from slipping by tying a string tightly around them.

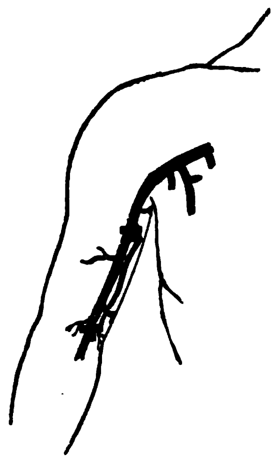


FIG. 169.—Course of the main artery in the arm. Cross show point for applying pressure.

If an elastic tourniquet can not be secured it may be advisable to apply a tourniquet higher up on the limb with a suitable pad over the main artery. A carefully constructed band with a suitable pad properly placed so as to compress the large artery supplying the part controls the hemmorrhage with less pain and damage to the tissues than the simple constricting tourniquet which is applied to immediately stop the loss of blood.

METHOD OF APPLYING TOURNIQUETS TO MAIN ARTERIES.

To apply such a tourniquet properly one should know the location of the large artery which supplies the part. In the arm the main artery runs downward on the inner side and its location corresponds very closely to the inside seam of the sleeve in the upper part of the arm (fig. 169). In the upper part of the thigh the main artery will be found in the front part of the thigh just a little to the inside of the crease of the trousers (fig. 171), and may be easily compressed by pressure directly downward against the thigh bone (fig. 172). All inelastic tourniquets should be fairly broad to avoid bruising the flesh. Where a pad is used it is wise to place a folded towel under the tourniquet on the opposite side of the limb to prevent it from cutting too deeply into the flesh (fig. 173). The band is placed around the limb near the armpit in the case of the arm, or close to the groin for the lower extremity. The exact location of the artery can be determined by searching for it in its proper location by the finger tips, the artery being recognized as a fairly large pulsating cord. The pad which may be a tightly folded

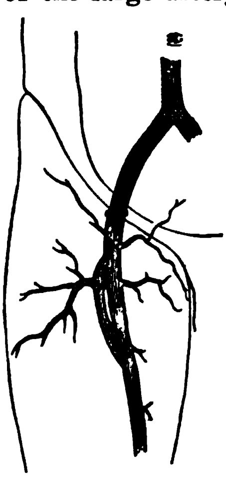


FIG. 171.—Course of main artery in the thigh. Cross shows point for applying pressure.

handkerchief, a smooth stone, wrapped in cloth, a flat cork, or even a watch, is placed over the artery in such a position that the pressure of the band will pull it down on the artery and compress the artery against the bone underneath. The tourniquet is wrapped around the pad and the limb, tied loosely, and then lightly twisted up with a stick or similar object, as above described. The lower provisional tourniquet is now loosened and removed. It may be found that the bleeding has ceased, in which case no tourniquet will be necessary. If the bleeding begins as soon as the lower tourniquet is loosened, the upper one is tightened sufficiently to check the hemorrhage and the stick fastened in the proper location (fig. 167).

Tourniquets can only be used on the extremities or around the forehead. In any case of severe bleeding one should instantly compress the main artery by means of the thumb or fingers and control the loss of blood in this manner while a tourniquet is being improvised or procured (fig. 172). The vessel can not be held with the fingers for more than a few minutes, as the operator will very quickly become fatigued.

Venous hemorrhage from the extremities can also be controlled by a tourniquet if sufficient pressure is applied to close the arteries which are sending the blood to the veins. If the application of the tourniquet between the wound and the heart apparently increases the hemorrhage instead of checking it, it is due to the fact that veins are wounded and the tourniquet is not properly applied so as to completely shut off the arterial blood supply, but is interfering with the venous return, therefore making the hemorrhage worse instead of better. In such a case tourniquet and pad should be readjusted and more pressure applied. If the hemorrhage is of mixed origin, both veins and arteries being severed, as is generally the case, the control of the arteries is all that will be required, and as soon as they are properly compressed the bleeding, both venous and arterial, will cease.

In ordinary first-aid work tourniquets are applied simply to check the loss of blood until the doctor arrives to assume charge of the case. If no doctor is available or can not be reached for a considerable time, it will be necessary for the operator to proceed immediately after the application of the tourniquet to consider other means of checking the homorrhage permanently, because it will be necessary, as has been stated above, to remove the tourniquet sooner or later.

If the services of a doctor can not be secured in the immediate future, the case becomes a somewhat difficult one, because tourniquets can not be left in position for an indefinite time. The tissues require the circulation of the blood in order to keep them alive, and if the blood is shut off too long the part will die and gangrene follow. Tourniquets, then, must be classed solely as a temporary expedient

for checking severe hemorrhage until some other means can be employed. It is certainly not safe to allow a tourniquet to remain on longer than three hours. It must also be remembered that the great pressure exerted in twisting up a band with a stick in the manner described may inflict severe injury on the nerves or other structures if continued for too long a period. A case has been recorded in which a heavy cord was wrapped around the wrist and twisted up with a policeman's night stick and so much damage done to the tissues inclosed by the cord that the patient never recoverd the full use of the hand.

If a layman finds that he must assume the after treatment of such a patient, he has two procedures to adopt. The wound may be packed or the bleeding artery tied. If the severed artery is small, packing will probably be successful. If the artery is large, it must be tied. The size of the artery may be estimated by the amount of blood which comes from the wound before the tourniquet was applied. If in doubt as to which course to pursue it is generally best to pack the wound, then if packing fails, an attempt may be made to tie the artery later. It is possible to pack such a wound under practically all circumstances, hence this will be the method of choice if the accident has happened in the woods or some other remote place, when the necessary materials for tying an artery are not at hand and can not be improvised.

TYING ARTERIES.

Arteries may be tied with either silk, linen, or cotton thread. The string used for tying an artery is called a *ligature*. Surgeons often use specially prepared sterile catgut ligatures because this material is absorbed in time by the tissues and causes less trouble than silk or cotton if the wound becomes infected. The strength of the string selected depends upon the size of the artery. Fairly large arteries should be tied with strong string similar to that used by grocers, while medium-sized vessels can be safely closed with one or more strands of heavy thread such as is used for sewing on buttons.

In order to find the artery and get at it, it will generally be necessary to have an assistant pull the edges of the wound apart with some sort of an instrument. The handles of tea or table spoons can be used for this purpose. Bending the handle at a right angle to the shaft about 2 inches from the end makes a sort of hoe-shaped instrument very suitable for this purpose and enables the assistant to hold the wound open without getting his hands in the way of the operator (fig. 174). For a large, deep wound use tablespoons.

METHOD OF TYING ARTERIES.

Boil 2 tablespoons, 2 teaspoons, a pair of scissors, a hair pin or probe, several artery forceps, if they are available, 4 or 5 stout

needles, and a dozen pieces of stout thread about 12 inches long. If possible, the operator should have two assistants, one to manipulate the tourniquet, the other to sponge the wound. While the instruments are boiling, the operator and one assistant should carefully prepare their hands according to the method described on page 184. Artery forceps are provided with locks so that when the handles are closed the points of the forcep will firmly hold any material which is within their grasp (fig. 175). When the instruments have been boiled and cooled, and the hands sterilized, the operator places them alongside of the patient in the pans and fearlessly scoops out all blood clots from the wound. The edges of the wound are held apart by means of the handles of the tablespoons in the hands of the assistants, so that the interior of the wound can be freely inspected. The wound is dried by pads of sterile gauze. The third assistant now loosens the tourniquet a little. The operator watches the wound carefully, and as soon as the place from which the blood is coming is located, he grasps a small part of the tissues around the opening with the blades of the artery forcep and locks the handles. If the forcep is applied in the proper manner this should check the bleeding from that spot. If other freely bleeding points are noticed they are grasped with the other forceps. The operator may have to make several attempts before he gets the forceps properly applied so that it closes the opening in the blood vessel. The tourniquet can be tightened between each attempt and the blood cleaned out of the wound before making another trial. When the bleeding point has been properly grasped, the assistant makes gentle traction on the forceps so as to raise the tissues slightly from the side or bottom of the wound. One or more of the prepared strands of thread are now placed around the forcep and worked down to the point. The handle is depressed and a single surgeon's knot tied loosely in the thread, which is worked downward with the tips of the fingers so as to grasp the tissues below the point of the forcep. The point must not be included in the ligature or otherwise it will be displaced when the forcep is removed.

Having gotten the ligature in the proper position hold it there with a probe, hairpin, or other narrow instrument while the knot is drawn up tightly and several other knots added for additional security. The first knot should be what is known as the surgeon's knot, which can best be understood by looking at figure 177. When the knots are firmly in place the handles of the forceps are unlocked and it is carefully withdrawn. The ends of the ligature are now cut off about one-third of an inch from the knots. The same procedure is applied to any other forceps which have been in use. In the absence of an artery forcep a needle may be inserted into the tissues under the bleeding point, the tourniquet tightened, the needle

FIG. 176.—Method of tying artery with artery forceps.

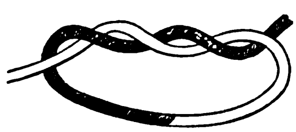


FIG. 177.—Surgeon's knot, first step. (From Da Costa's Surgery. Courtesy W. B. Saunders Co.)

FIG. 178.—Method of tying artery over a needle.

FIG. 180.—Point for applying pressure for checking hemorrhage from the forehead.

FIG. 181.—Method of applying tourniquet around forehead to check severe hemorrhage from the scalp.

FIG. 182.—Point of applying pressure in hemorrhage from the lips or cheek.

raised slightly so as to draw the tissue away from the wound, and a piece of thread tied under the needle so as to include a small amount of flesh, the ends cut off one-third of an inch from the knots, and then the needle withdrawn (fig. 178). After the hemorrhage has been checked by tying up the bleeding points and no serious bleeding occurs when the tourniquet is loosened, the wound may then be swabbed with tincture of iodine and closed by stitches, if it gaps widely, and a wick composed of a number of strands of thread left in the lower corner of the wound hanging out for about an inch for drainage. This wick is removed in 48 hours if no signs of inflammation occur, and the stitches can be removed in from five to six days.

In desperate cases, when all other measures fail, and the bleeding recurs every time the tourniquet is removed, it may be necessary to sear the bleeding point or places in the wound with a hot iron in order to check hemorrhage and save life. An iron rod, such as a poker, bolt, or large wire nail, may be heated for this purpose over any fire and should be sufficiently hot to thoroughly cook the flesh with which it is held in contact. After the wound has been seared no attempt should be made to close it with stitches.

AFTER TREATMENT OF SEVERE HEMORRHAGE IN GENERAL.

Patients who have lost a great deal of blood are in a weakened condition and may require careful after treatment. They should be kept in bed and all possible movement avoided. not even permitting them to go to the toilet in severe cases. The food should be light but nutritious and given in small quantities at frequent intervals. Milk toast, broth, and raw egg beaten up in milk, thin custards, etc., makes a good diet for the first few days. Afterwards it may be advisable to give doses of iron and strychnine to assist in building up the general strength. One-sixtieth of a grain of strychnine sulphate may be given three times a day, a half an hour before meals, and five drops of the tincture of iron in water at meal time, to be taken through a tube in order to avoid staining the teeth.

The patient should be kept in bed until his color has improved and should not be permitted to do hard work for some time.

BLEEDING FROM SPECIAL PARTS.

HEMORRHAGE FROM THE SCALP.

See wounds of the scalp, page 199.

HEMORRHAGE FROM THE FACE AND FOREHEAD.

The face has an abundant blood supply and bleeds freely when cut. Usually pressure with a compress against the bone underneath will be sufficient to arrest ordinary bleeding.

If the blood comes in spurts from a wound of the forehead, apply pressure with the thumb in front of the ear, as the main artery passes up in this location (figs. 179 and 180).

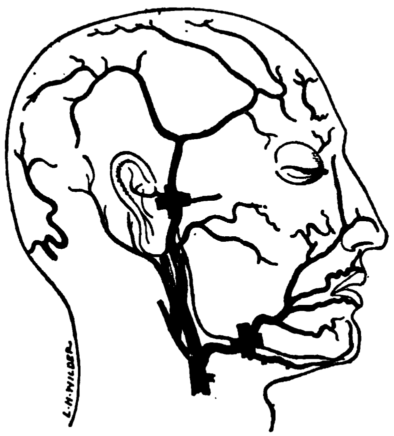


FIG. 179.—Blood supply of the face. Crosses show points for applying pressure to check hemorrhage.

A large artery which crosses the lower jawbone supplies the lips, cheeks, and nose. Severe bleeding from these localities may be controlled by pressure on this artery made against the jaw about 2½ inches from the point of the chin (figs. 179 and 182). In endeavoring to stop hemorrhage by pressure of the fingers on a main artery, it may be necessary to shift the position of the fingers slightly in various directions until the proper spot is located.

HEMORRHAGE FROM THE NECK.

There are many large blood vessels in the neck, and if one or more of these are severed furious bleeding results.

First-aid treatment.—It is impossible to apply a tourniquet to the neck, as it would cause immediate suffocation. Pressure inward and backward against the backbone should be made by the thumb, placed just above the breastbone. Make the pressures slightly from the side to avoid closing the windpipe (fig. 184). If the hemorrhage is very severe, push the first available material at hand, such as a handkerchief or the end of a towel, into the wound, and hold it in place with backward pressure against the backbone. Send for a doctor at once. Have the patient sit up in a chair.


FIG. 183.—Main arteries of the neck. Crosses show points for applying pressure to check hemorrhage from neck, shoulder, or arm pit.

After treatment.—It will be necessary to hold the compress in place for a long period. Several persons may relieve each other in this

work. If artery forceps are available, it may be possible to grasp the bleeding vessels and tie them with boiled heavy thread.

HEMORRHAGE FROM THE TRUNK.

Tourniquets can not be used to check bleeding from wounds of the chest, back, or abdomen. Hemorrhage from such localities is controlled by pressure, and when that fails by packing.

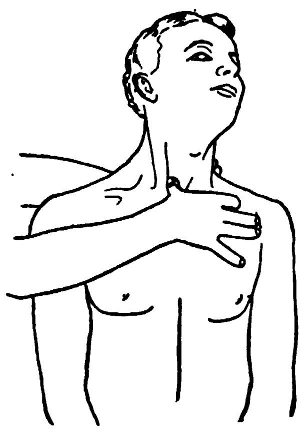


FIG. 184.—Point of applying pressure to check hemorrhage from the neck.

HEMORRHAGE FROM THE PALM OF THE HAND.

Bleeding from deep wounds of the palm may often be checked by placing a large, firm, ball-shaped pad in the palm, closing fingers around it tightly, and bandaging them in place. A round stone wrapped in a handkerchief makes an excellent emergency pad for this purpose.

HEMORRHAGE FROM THE NOSE.

If it becomes necessary to check nosebleed the patient should be placed in a semirecumbent position, that is, lying on a bed or couch with shoulders and head slightly elevated. This can be easily done by placing a tipped-over chair behind the patient (fig. 186). A flexible roll about 2 inches long and one-third of an inch in diameter should then be made out of newspaper or muslin and forced under the upper lip. This pad goes well up between the gum and the lip and does not rest on the teeth. It should be firmly pushed in place and should put the lip under considerable tension. The patient should remain absolutely quiet and should on no account blow the nose, as this will detach the clot and the hemorrhage will start afresh. Ice applied to the back of the neck will sometimes prove effective. If these remedies fail and the hemorrhage continues for a long time, as a last resort it may be necessary to pack the nostril. This is done by introducing into the nose a long strip of gauze or mus-

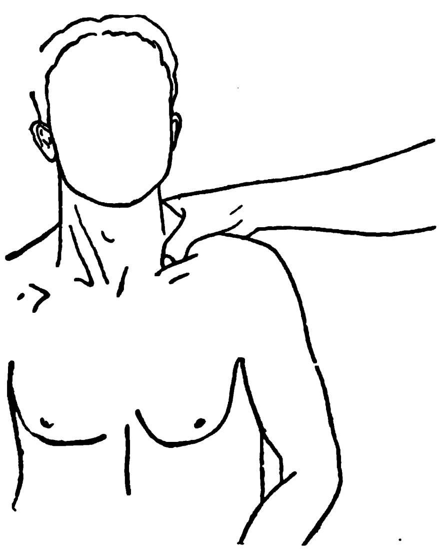


FIG. 185.—Point of applying pressure to check hemorrage from the shoulder or armpit.

lin about an inch and a half wide by means of a blunt end of a penholder or a similar blunt-pointed instrument. The gauze should be packed in firmly, filling the back part of the nostril first and gradually working forward. One end of the strip should be left out of the nose in order to facilitate its removal.

HEMORRHAGE FROM A TOOTH SOCKET.

This can often be checked by holding ice water or hydrogen peroxide in the mouth. Failing in this, make a cone-shaped pad of gauze or cotton, force it into the socket, and hold in place by closing the jaws tightly.

HEMORRHAGE FROM THE LUNGS.

Description.—Hemorrhage from the lungs occurs chiefly in tuberculosis, but may be caused by other conditions.

Treatment.—The patient should be placed in bed in a semireclining position as shown in figure 186. An ice bag should be applied to the chest, or a towel rung out in cold water, which is frequently renewed. The patient should remain absolutely quiet, and if it is obtainable a quarter of a grain of morphine should be given by the mouth, or 10 drops of tincture of opium, or a teaspoonful of paregoric. It is of no use to give the patient salt as is frequently advised. Blood from the lungs is coughed up, is more or less frothy, and is often bright red in color.

HEMORRHAGE FROM THE STOMACH.

Description.—Hemorrhage from the stomach occurs in ulcer of the stomach, also in cancer and other conditions. The blood is vomited up and generally mixed with food, and may be bright red or dark brown in color.

Treatment.—Place the patient in bed in a semireclining position. Allow him to swallow small pieces of ice. These should be actually swallowed and not sucked. If hydrogen peroxide is available a teaspoonful in a little water may be given. If antipyrin is at hand give 10 grains. Keep the patient absolutely quiet and allow no food for at least four hours after all bleeding has ceased. The diet at first should be liquid.

HEMORRHAGE FROM PILES.

Where the bleeding from piles becomes excessive the patient should keep off his feet as much as possible, and in severe cases go to bed. The hips should be elevated upon a pillow, and an enema of 4 ounces of ice water may be injected into the rectum by means of a fountain syringe, and cloths rung out in ice water or an ice bag applied to the

anus. These compresses should be changed every few minutes, because if they are permitted to become warm they will act as a poultice and increase bleeding instead of checking it.

HEMORRHAGE INTO THE ABDOMEN.

Severe injuries such as crushes or perforating wounds of the chest or abdomen may give rise to internal abdominal hemorrhage.

Symptoms.—Gradually increasing pallor. The pulse gets rapid and weak. There is a peculiar sighing form of respiration. Marked thirst. Pain in the abdomen. The patient vomits and is very restless. Later attacks of fainting may come on.

First-aid treatment.—Send for a physician at once. Place the patient in a recumbent position with the head low. Apply cold to the abdomen and keep the person as quiet as possible.

After treatment.—Keep the patient absolutely quiet in bed. Allow small quantities of warm water for the thirst. Apply an ice bag or cold applications to the abdomen.

SUMMARY OF THE TREATMENT OF HEMORRHAGE.

Ordinary bleeding from the arm or leg can be controlled by raising the part and by pressing a sterile or clean pad firmly on the wound. The pad may be held in the fingers or fastened in place by tying a handkerchief tightly around the limb.

If pressure and elevation fail, apply a tourniquet if medical help can be obtained soon. If the services of a doctor will not be available for four hours or longer, pack the wound with stirile gauze or muslin.

In all cases of very severe bleeding of the extremities or when the blood comes in spurts apply a tourniquet immediately.

In hemorrhage from the scalp, fasten a sterile compress on the wound by a bandage or handkerchief around the head. Failing in this, tie a tight band around the forehead just above the wound.

In hemorrhage from the neck, press the large artery in the side of the neck against the backbone with the thumb. Failing in this, if the hemorrhage is severe, pack the wound immediately with any material available, using the cleanest thing obtainable.

In hemorrhage from wounds of the trunk, apply pressure by a gauze compress, and failing in this, if the wound is bleeding freely, pack it with sterile gauze.

Tourniquets must not be left on for more than two or at the most three hours.

Remember that a man who has lost a good deal of blood may require constitutional treatment after the bleeding has been stopped.

SHOCK.

After a severe accident the patient almost always goes into a peculiar mental and physical condition, which is called *shock*. This condition may immediately follow the injury or may not develop for some time. Shock may be described as a condition of extreme general depression produced by injury or profound emotion. The state of shock is somewhat similar in some respects to extreme exhaustion or collapse. The amount of shock does not always correspond to the gravity of the injury, some individuals being much more susceptible to it than others. Shock is dangerous, and every one who is treating an injured man should bear it in mind and examine him to determine whether it is present.

Symptoms of shock.—The face is pale with a dull expression. The skin is cold and covered with a clammy perspiration. The pulse is weak and rapid. It may be impossible to feel the pulse at the wrist. The patient is usually conscious but is in a peculiar state of mental indifference, lying with the eyes partially closed and making no effort to move. He may respond to questions, but no dependence can be placed on the truth of his statements. He rarely feels pain and seems to be indifferent to his fate. The breathing is rapid, irregular, and shallow, sometimes gasping. Under suitable treatment recovery from the condition may be expected, but in severe cases shock may continue and death follow.

Shock is a merciful provision of nature to prevent suffering on the part of injured people. It is stated than animals go into shock, and that when carnivorous beasts seize their prey that the victim becomes immediately numb and feels no pain. When a cat plays with a mouse, which she has captured, the mouse is not suffering the torture which the observer would imagine.

When a person makes much continuous outcry after an accident, it is probable that his condition is not dangerous. The seriously injured individual lies quiet and may escape notice on account of his apparent indifference to what has happened. Where a number of persons have been hurt, it is generally a safe rule to give aid first to those who are evidently gravely injured but making the least complaint.

Treatment.—The symptoms of shock give a fairly clear idea as to what the treatment should be. The body is cold, hence it should be warmly covered, the patient lying in a recumbent position with the head low. External heat should be immediately applied by means of bottles, jugs, or other containers filled with hot water. These should be placed alongside of and between the legs and around the feet. In emergencies hot bricks or even hot stones can be used. Great care should be taken that the patient is not burnt by these

FIG. 186.—Propping patient in a semireclining position with a chair.

FIG. 187.—Treatment of shock with emergency hot-water bottles.

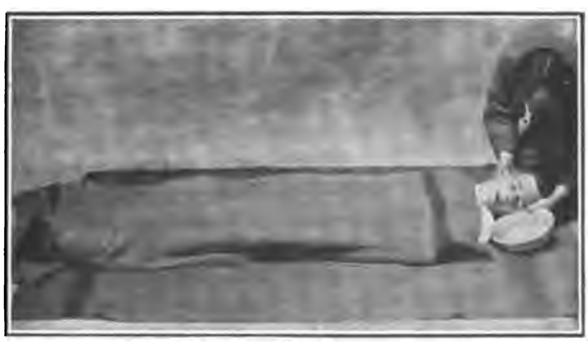


FIG. 188.—Turning the head to one side when patient vomits.

FIG. 189.—Circular bandage. (From Fowler's Surgery. Courtesy W. B. Saunders Co.)

FIG. 190.—Method of making the spiral reverse bandage. (From Fowler's Surgery. Courtesy W. B. Saunders Co.)

FIG. 191.—Fastening a bandage by splitting the ends.

FIG. 194.—Figure of eight of the wrist and hand. (From Fowler's Surgery. Courtesy W. B. Saunders Co.)

appliances, however, and they should be well wrapped with towels, old clothing, or similar material, and never placed in direct contact with the skin. The heart is weak, hence stimulants should be given. The best of these for shock is probably a small quantity of very strong hot black coffee. Aromatic spirits of ammonia, one-half a teaspoonful in a half tumblerful of water, is also another excellent remedy. Very small quantities of warm soup or milk are sometimes useful. Atrophine sulphate in doses of 1/100 of a grain is highly recommended. Do not repeat oftener than every three hours. Liquor in shock is of questionable value. If no other stimulants are available, however, a moderate-sized drink of whisky may be given in warm water. It should not be repeated, because in overdoses it tends to increase the general depression. Shock is sometimes due to concealed hemorrhage, and this should always be looked for with great care. A patient should never be moved while he is in shock, or disturbed in any way, unless it is absolutely unavoidable and necessary to save life. This, of course, does not apply to putting a man in an ambulance and taking him on a short trip to a hospital, where he can receive very much better treatment, or to a man lying on the street a cold winter day, where the dangers of a short move into a warm house will be more than offset by the favorable surroundings which are thus secured.

Unconscious patients can not be given stimulants by the mouth, in which case smelling salts can be held under the nose, or a few drops of ammonia water sprinkled on a handkerchief and the patient allowed to inhale the fumes at intervals a minute apart. The application of external heat is almost always available, and should be conscientiously and thoroughly followed out. There are other forms of treatment for shock, but they are only available to the skilled physician. Raising the feet or legs and rubbing the extremities toward the heart, in order to encourage the flow of blood to that organ, is sometimes useful, but these measures are only applicable when the patient is in a warm room or on a warm day.

One can tell that the patient is recovering from shock by the disappearance of the symptoms. The face recovers its natural color, the skin becomes dry, the respiration is full and regular, and the pulse, as felt at the wrist, becomes stronger and slower. When the patient has reacted in the above-described manner and the symptoms of shock have disappeared, it is then safe to move him or to undertake other measures necessary for his treatment.

In reacting from shock, vomiting often occurs. If an unconscious person starts to vomit, always turn his head to one side, so that the ejected matter runs out of the mouth and does not get back into the windpipe (fig. 188).

In case a patient who has shock is found to be bleeding freely, the first indication is to stop the hemorrhage, and this must be done regardless of his condition, as there is no hope of recovery as long as the loss of blood continues. For methods of checking hemorrhage, see page 204.

BANDAGES AND BANDAGING.

Bandages are used to hold dressings on wounds or other injuries, to keep splints in place, to hold the extremities in various positions, and to apply pressure to different parts of the body.

Bandages are generally made of muslin or gauze. There are three principal varieties of bandages in common use, the roller bandage, triangular bandage, and the many-tailed bandage.

ROLLER BANDAGE.

These bandages are composed of long, narrow strips of muslin or gauze. The gauze roller bandage is the better because it has considerable elasticity and is easier to fit to the part. The use of roller bandages requires some training and considerable practice. It is not difficult, however, to apply a roller bandage to the finger, wrist, or the knee joint.

Roller bandages come in different widths, and if satisfactory results are desired the proper width must be used for the part to which it is applied. For example, a bandage about three-quarters of an inch wide is most suitable for the finger. For the hand the bandage should be about an inch and a half wide; for the wrist or arm 2 to 2½ inches wide; for the thigh and body a 4-inch roller is most convenient. The length of the bandage depends to a certain extent on its width, ranging from a yard for finger bandages up to 10 yards for the bandages intended for the body or thigh. Short roller bandages are of very little practical use. A strip of wide roller bandage, that is, 4 or 6 inches, makes an excellent sling, and similar strips of bandage are useful in fastening on splints. Properly rolled bandages may be easily cut with a sharp knife into any width desired. Narrow strips of adhesive plaster applied from the top to the bottom of the bandage will greatly help in keeping it from being disarranged.

METHOD OF APPLYING ROLLER BANDAGES.

Having selected the proper size, hold the bandage in the right hand. Place the free end of the bandage on the part and prevent it from slipping with the forefinger or thumb of the left hand.

The bandage is wrapped around the limb, passing from the operator's left to right, as it goes across the front. On bandaging the trunk or upper parts of the extremities, it is necessary to pass the bandage from the right to the left hand in going behind.

THE SPIRAL REVERSED BANDAGE.

If the part to be covered is of the same diameter all the way up, the bandage is simply wound around the limb or body, each turn overlapping the preceding one by about two-thirds of its width. This is known as a circular bandage (fig. 189). If the part increases in diameter as the bandage ascends, as, for instance, the calf of the leg, it is necessary to make a half turn or fold with the bandage at each revolution where the limb becomes larger. This is called the "reverse" and is essential in order to make a snug fit and to prevent the bandage from slipping off. To do this the thumb or forefinger of the left hand is placed on the bandage in the front of the limb and the bandage given a half turn on itself, making it point in a downward direction instead of upward (fig. 190). The reverse is repeated at every turn until the greatest diameter of the limb is passed, when ordinary circular turns may again be resumed. The bandage is fastened by pinning the end with a safety pin, covering it with a strip of adhesive, or by splitting the bandage for 6 or 8 inches, tying a knot in the strips at the beginning of the split and bringing one of the split parts around in one direction and the other in the opposite, and then tying them (fig. 191).

Roller bandages should be applied firmly, but neither too tightly nor too loosely. If they are too tight, they will shut off the circulation and cause considerable pain. If they are too loose, they very quickly come off or will permit the dressing to be displaced from the wound. In using a roller bandage the ends of the fingers or toes should always be left out of the bandage, so that the operator can see if the circulation has been stopped. To test this matter press against the toe for a moment with the operator's forefinger and then take the finger away quickly. This will leave a white spot, and if this spot quickly becomes red again the circulation is all right. If the color returns very slowly, the circulation has been interfered with and the bandage should be reapplied.

FIGURE-OF-EIGHT BANDAGE.

In applying a circular bandage about the knee or other joint it will be found very easy to use it in this manner. Three or four turns of the bandage are made below the joint and then a turn is made above, then another turn below and a turn above. These are alternated

FIG. 192.—Figure of eight of the knee, spiral turn in place. (From Foote's **Minor Surgery**, Courtesy D. Appleton & Co.)

FIG. 193.—Figure of eight of the knee completed. (From Foote's **Minor Surgery**, Courtesy D. Appleton & Co.)

FIG. 195.—Bandage of the finger. (From Fowler's Surgery. Courtesy W. B. Saunders Co.)

FIG. 196.—Bandage of the toe. (From Fowler's Surgery. Courtesy W. B. Saunders Co.)

FIG. 198.—Bandage of the wrist, forearm, and elbow. (From Fowler's Surgery. Courtesy W. B. Saunders Co.)

FIG. 199.—Ascending spica of the groin. (From Fowler's Surgery. Courtesy W. B. Saunders Co.)

FIG. 204.—Modified Barton's bandage for lower jaw. (From Fowler's Surgery. Courtesy W. B. Saunders Co.)

FIG. 205.—Triangular bandage of the groin. (From Fowler's Surgery. Courtesy W. B. Saunders Co.)

FIG. 210.—Method of enveloping hand in a triangular bandage, step one.

FIG. 206.—Spiral bandage of the chest. (From Fowler's Surgery. Courtesy W. B. Saunders Co.)

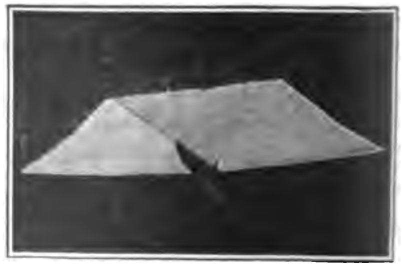


FIG. 211.—Method of enveloping hand in a triangular bandage, step two.

until the whole joint is completely covered (figs. 192 and 193). This bandage fits neatly and is hard to displace.

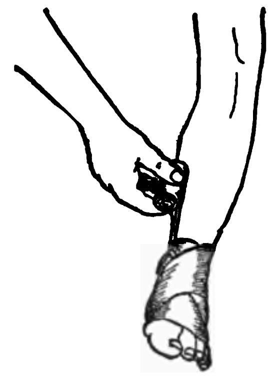


FIG. 203.—Bandaging the foot.

In bandaging the fingers or hands three or four turns are generally made first around the wrist to gain a point of support and then the bandage run to the fingers or palm of the hand, as the case may be. At the finish it is again run to the wrist and given an additional turn or two. This keeps the bandage from slipping off (fig. 195).

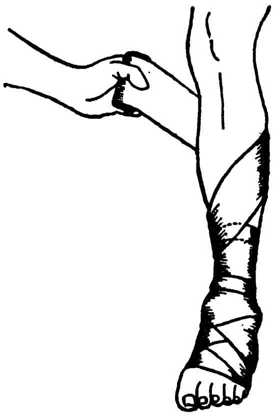


FIG. 200.—First step, figure of eight of the calf.

In bandaging the foot or toes, it is always best to begin at the ankle, making several turns, and then to work down to the part which it is desired to cover (fig. 196). In bandaging the foot and leg the ends of the toes must be always left exposed. The pressure of the bandage should always be greater at the bottom and gradually decreased as it goes up the leg.

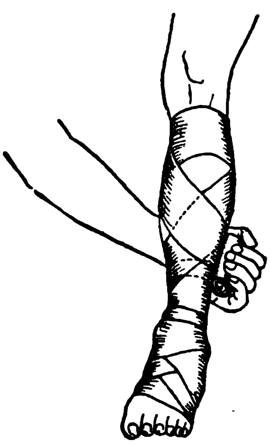


FIG. 201.—Second step, figure of eight of the calf.

THE RECURRENT BANDAGE.

When it is necessary to cover the end of a finger or stump, several circular turns are made at the base, and then the bandage is led backward and forward from the base over the end, the loops being held by the fingers until they are secured by regular spiral turns (figs. 207 and 208).

FIG. 202.—Figure of eight of the calf, completed.

The great objection to the roller bandage in first-aid work is the practice required to apply it so that it will remain in place and also the difficulty which is encountered in trying to obtain these bandages in an emergency.

Most bandages are difficult to describe in words and are better understood from pictures, hence a number of illustrations of the most useful types have been included in this supplement.

FIG. 207.—Recurrent bandage of the fingers. (From Foote's Minor Surgery, Courtesy D. Appleton & Co.)

FIG. 208. Recurrent bandage of the fingers, completed. (From Foote's Minor Surgery. Courtesy D. Appleton & Co.)

THE TRIANGULAR BANDAGE.

The triangular bandage has been much advocated for emergency use and for those who are inexperienced with the roller bandage. This bandage, also called the Esmarch's bandage, comes in the shape of a triangle, being about 36 inches long on the short sides and about 51 inches on the diagonal. Such a bandage makes an excellent sling and also a good tourniquet. It can be used to completely envelop a hand or foot in the case of a crushing injury (fig. 210). Folded up on itself so as to make a strip about 4 inches wide, it is known as the "cravat" bandage, and is useful for holding dressings in place about the head. The various applications of the Esmarch bandage can be best understood by a study of the illustrations.

EXPLANATION OF NUMBERS SHOWN ON FIGURES IN ILLUSTRATION OF ESMARCH BANDAGE (fig. 209).

1. Broken leg below knee and at ankle. Umbrella used as splint.
2. Broken arm—upper arm and at wrist. Rough wood splints used.
3. Hand bandage. (See also No. 7.)
4. Wide sling for arm.
5. Upper-arm bandage. (See also No. 18.)
6. Thigh bandage.
7. Hand bandage. (See also No. 3.)
8. Eye bandage.
9. Scalp bandage.
10. Chin and face bandage.
11. Knee bandage.
12. Wrist and forearm bandage. Rough wood splints used.
13. Bandage for back.
14. Elbow bandage.
15. Foot bandage.
16. Splint and bandage for broken thigh and ankle.
17. Splint and bandage for broken leg.
18. Arm bandage.
19. Chest bandage, rear view.
20. Chest bandage, front view.
21. Skull bandage.
22. Forehead bandage.
23. Heel bandage.
24. Narrow sling for arm.
26. Forearm bandage.
29. Throat bandage.
31. Hip bandage.
32. Shoulder bandage.
33. Stopping artery bleeding of arm with hand pressure.
34. Stopping artery bleeding of arm with tourniquet.
35. Stopping artery bleeding of leg with hand pressure.
36. Stopping artery bleeding of leg with tourniquet.

37, 38. Removing foreign substance from eye.

The triangle bandage is frequently found in first-aid packets and is sometimes covered with pictures illustrating its use. However, such bandages are generally stiff and difficult to apply snugly.

76912°—19——18

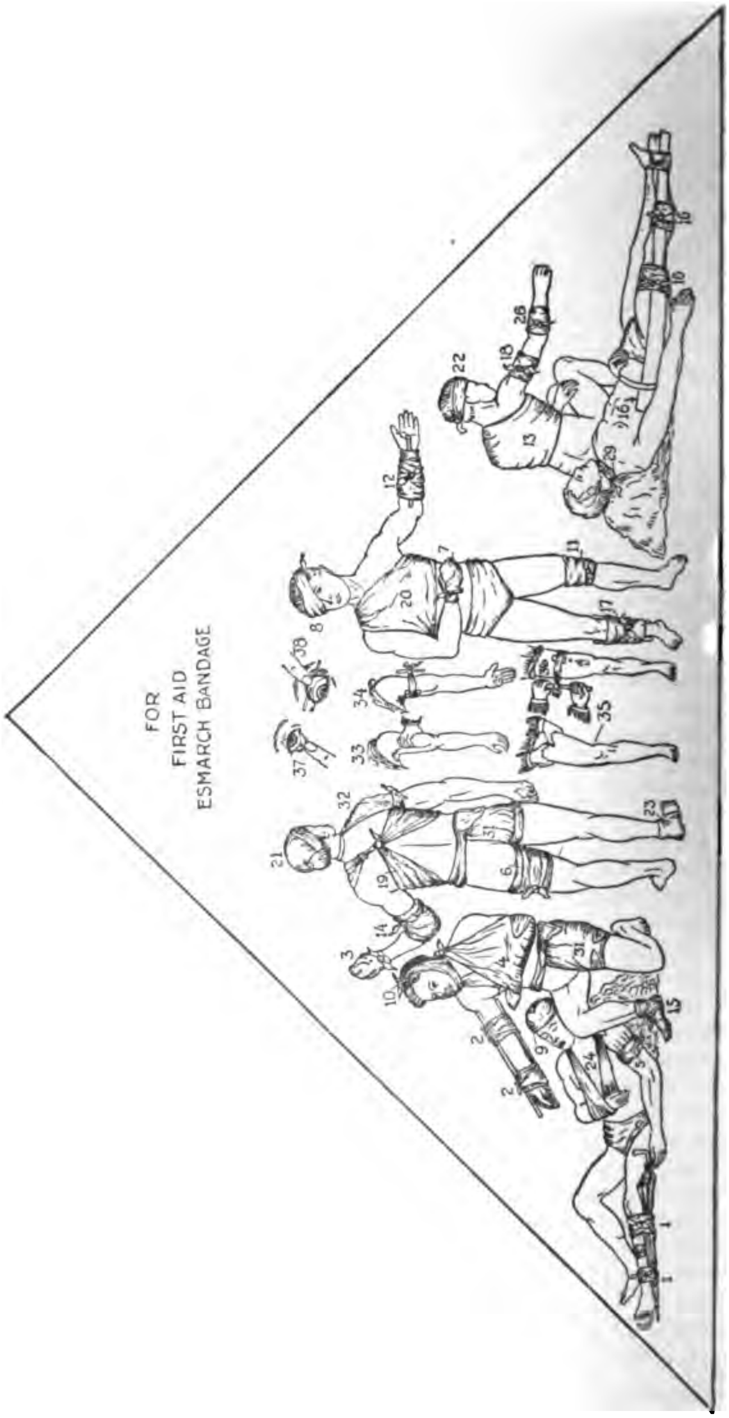


FIG. 200.—Various applications of the triangular bandage.

FIG. 212.—Method of enveloping hand in a triangular bandage, step three.

FIG. 213.—Method of enveloping hand in a triangular bandage, step four.

FIG. 214.—Method of tearing a many-tailed bandage.

FIG. 216.—Many-tailed bandage applied.

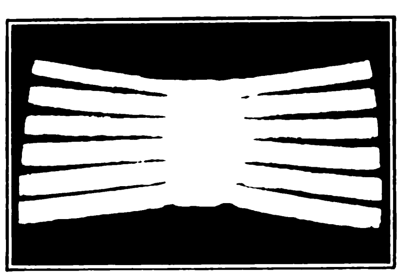


FIG. 215.—Many-tailed bandage, complete.

Fig. 219.—Four-tailed bandage of the jaw, back view.

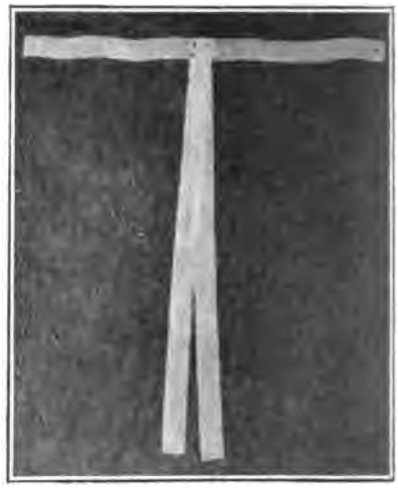


Fig. 220.—T bandage.

Fig. 221.—T bandage applied.

Fig. 222.—Dressing fastened to the undershirt, step one.

THE MANY-TAILED BANDAGE.

This is probably the most useful all-around bandage for first-aid work, because it can be applied by anyone who has once seen it used and can be improvised out of materials which are generally at hand. The many-tailed bandage is simply a series of strips of muslin which are tied around the limb, but instead of being entirely separated are left attached to each other at their middle. This attachment serves to hold them in place and to keep the bandage in position.

To make a many-tailed bandage, take a strip of cloth long enough to go completely around the limb and dressing and provide ends which can be tied. The ends are folded together and notched with scissors or a knife at intervals of about an inch and a half. The

FIG. 217.—The four-tailed bandage 1.

FIG. 218.—The four-tailed bandage 2.

cloth is torn at these points almost to the fold but not quite (fig. 214). The bandage is applied by laying it under the limb, straightening out the tails, and tying each tail with its fellow over the dressing in front of the limb (fig. 216). For neatness the loose ends, after they are tied, may be placed under the next one as they are fastened, thus giving the dressing a better appearance. Such a bandage can be easily loosened or tightened as occasion demands, and it can be removed and the dressing changed and the bandage used over again. It can be applied to any part of the body and holds its position well. It should be made out of muslin, old sheeting being excellent for this purpose.

THE FOUR-TAILED BANDAGE.

The four-tailed bandage is merely a variety of the many-tailed bandage. It is made of a piece of muslin 5 to 8 inches wide and

about three feet long. It is torn down the middle from each end. leaving a strip about four inches long which is undivided. For illustration and instructions for use of this bandage, see figures 217 and 218. Triangular and many-tailed bandages are fastened by knotting the ends or pinning them.

THE T-BANDAGE.

This is made by taking a strip of cloth 4 inches wide and long enough to tie comfortably about the waist. Another piece of cloth about 3 inches wide, but 5 feet long, is doubled and the double end sewed or fastened with a safety pin to the middle of the first strip (fig. 220). This bandage is sometimes known as the "crutch" bandage and is much used for holding dressings on the region around the anus or genital organs. The bandage is applied by placing the first strip around the waist and tying or pinning. The double strips are then brought forward between the legs and pinned or tied to the first strip (fig. 221).

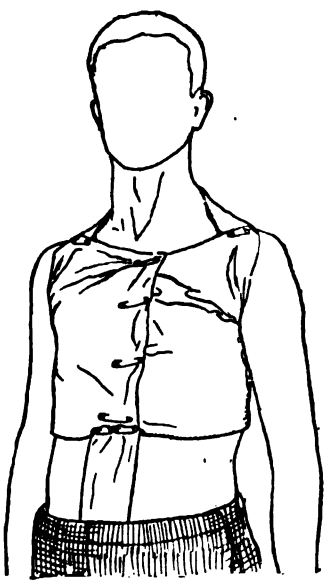


FIG. 228.—Showing method of holding down a oressing on the chest or abdomen by straps passing between the legs.

IMPROVISED BANDAGES.

There are certain parts of the body, such as the arm pit, back, and groin, on which it is difficult to retain a dressing. Frequently dressings or compresses can be held in these locations very satisfactorily by pinning them fast to the shirt and then taking up the slack in the underwear by pins on the other side of the body.

For applying a dressing to the back in this fashion the patient should be turned onto the abdomen, the undershirt rolled well up, so as to completely expose the area which it is desired to cover, and the dressings properly applied (fig. 222). The upper edge of the dressing is then pinned to the shirt with two or more safety pins, the shirt is rolled down over the dressing and pinned to the dressing at the bottom. The patient is gently turned on his side, holding the dressing in place while this is done, and the slack taken up by pinning the folds in the front part of the undershirt (fig. 223). The same method can also be applied for dressings on the chest or abdomen. It may be necessary to pin strips on the lower part of the tail of the shirt behind and bring them forward between the legs and up to the groin in order to keep the garment from working upward.

FIG. 223.—Dressing fastened to the undershirt, complete.

FIG. 224.—Dressing held in place with a stocking, step one.

FIG. 225.—Stocking dressing, complete.

FIG. 226.—Dressing held in place by head cap.

FIG. 227.—Dressing held in place by head cap, side view.

FIG. 231.—Showing method of stiffening handkerchief with a piece of cardboard folded in the center to hold dressing in proper position on the back of the neck. The dressing is pinned to the upper part of the cardboard.

FIG. 232.—Method of applying a sling made out of a triangular-shaped piece of muslin or a triangular bandage.

FIG. 233.—Applying sling, second step.

A dressing can be quite satisfactorily held in place on the foot or leg by a stocking. The stocking should be rolled up and unrolled over the dressing as it ascends the leg (fig. 224). Pieces of stocking legs make an excellent temporary means of holding dressings on the arm also in emergencies. Dressings can be held on the head of children or restless people by making a cap to cover the entire head, with strings to tie under the jaws. The dressing is fastened to the cap at the appropriate place.

Fig. 230.—Many-tailed bandage of the abdomen. (From Foote's Minor Surgery—Courtesy D. Appleton & Co.)

Fig. 229.—Many-tailed bandage of the abdomen. (From Foote's Minor Surgery—Courtesy D. Appleton & Co.)

Dressings may be retained on the lower part of the abdomen by means of a towel to which strips have been pinned and passed under the legs running from behind forward in order to prevent it from riding up (fig. 228).

A many-tailed bandage makes an excellent application for dressings of the lower part of the abdomen. The tails are brought across the abdomen diagonally and placed one over the other, pinned down the middle, and not tied. In all abdominal bandages bands must be run from behind forward between the legs and pinned in front to hold the bandage in place (fig. 230).

Dressings to the back of the neck are frequently required, especially for boils which are apt to occur in that situation. Such a dressing can be easily held in place by knotting a folded handkerchief around the neck, but there is a tendency for the handkerchief to permit the dressing to drop too low. To avoid this a piece of cardboard about 3 inches long and 2½ inches high should be folded in the center of the handkerchief and the upper part of the dressing pinned to this (fig. 231).

PLASTERS.

Court-plaster or adhesive plaster should never be applied directly over a wound. Such plasters generally contain germs, and they seal the wound up, preventing the escape of fluid, and causing conditions which greatly favor the multiplication and growth of bacteria. It is permissible to hold a small dressing of gauze in position over a wound by means of a strip of adhesive plaster, as, for instance, on wounds somewhere about the face, but the plaster should never touch the wound directly and there should be enough gauze under it to take up any discharges which may seep out of the injury (fig. 236).

In a great emergency where a physician is not available to treat a large, gaping wound it may be necessary to pull the edges of the wound together with strips of adhesive plaster. If this is done the plaster should be in narrow strips and wide intervals left between for the escape of secretions from the wound. A method of cutting these strips so that the interference with the drainage is reduced to the lowest possible point is shown in figure 237.

Strips of adhesive plaster are often useful in place of bandages in holding large dressings in place on the abdomen, groin, hip, or other localities where the inexperience of the operator makes it difficult to apply a bandage.

Before applying strips of plaster in this fashion the skin should be shaved if it is very hairy. Adhesive plaster may be removed without pain by wetting it in gasoline or ether. If the plaster has excoriated the skin, the raw places should be bathed with dilute alcohol, thoroughly dried, and dusted with boric-acid powder. If the dressing has to be reapplied, the strips of plaster should be so arranged as to come on a new surface where the skin has not been irritated. In using adhesive plaster as a means to retain dressings on the legs or arms, care must be taken that the strips do not completely encircle the limb, because if they do they may shut off the circulation and cause considerable injury.

FIG. 234.—Showing pad on the back of the neck to prevent pressure from sling on the neck.

FIG. 235.—Emergency sling made of two handkerchiefs.

FIG. 236.—Dressing held on with adhesive plaster.

FIG. 237.—Wound closed with adhesive plaster. (Not recommended. To be used only in great emergency.)

FIG. 238.—Cold compress applied to the knee. (Note the thickness and extent of compress.)

FIG. 239.—Cold compress covered with oiled paper.

FIG. 240.—Compress fastened in place with many-tailed bandage and on pillow protected with oilcloth.

MISCELLANEOUS MINOR INJURIES AND HERNIA.

BRUISE.

Description.—A bruise is the injury produced by a blow with some blunt object. Bruises are received in two ways—the body may be still and the object moving, as when a boy is struck by a thrown baseball, or the body may be moving and strike against some fixed object, as when a man falls and injures himself on a hard pavement. Bruises are the commonest of all accidents, and everyone has at some time suffered from them.

Symptoms.—The first symptoms of a bruise is pain; then the injured part quickly becomes red and slightly swollen. If the bruise is severe, the skin over it becomes black and blue after some hours.

Treatment.—If the injury is slight, no treatment is required. If more severe, cold-water compress should be applied. To make a cold-water compress take from 6 to 10 folds of old muslin, linen, or such material (a couple of thicknesses of turkish toweling makes an excellent compress). The dressing should be large enough to cover the injured surface and extend a couple of inches beyond, and should be thick enough to retain the moisture for some time. It is wrung out in cold water and then laid on the seat of the injury. Some covering will be required to prevent the dressing from becoming dry, and also to protect the clothing or bed. The most available material for this purpose is oiled paper. In an emergency an old piece of oil cloth or any flexible waterproof material will do very well. This is put outside of the compress and the whole held in place by a bandage of some sort. The compress may be continued for three or four days, after which rubbing the injured part twice a day with a mixture of equal parts of alcohol and water or undiluted whisky will help to take out the soreness.

BLACK EYE.

A black eye is merely one form of a bruise. As soon as a blow is received in this region a handkerchief wrung out in ice water should be applied. The ice water should be renewed as often as it gets warm, thus combining the effect of both cold and moisture. This treatment should be kept up from half an hour to an hour and may prevent discoloration from setting in.

If treatment is begun after the flesh has become black, hot-water applications for half an hour, three times a day, will hasten the disappearance of the swelling and discoloration. The old-fashioned practice of applying raw beefsteak is not recommended. In all cases where a severe blow has been received in the region of the eye a physician should be consulted, as there is danger that injury may have been done to the eyeball.

BRUISES WITH WOUNDS OF THE SKIN.

If the skin is cut or torn when a bruise has been received the injury becomes a lacerated wound and should be treated as directed on page 191.

STRAINS.

Description.—Strains are the injuries produced by overstretching a muscle. The muscle, in severe cases, may be partially torn or even ruptured. The muscles of the back, shoulder, and wrists are often the seat of strains. A sudden wrench or too great exertion frequently causes a strain.

Symptoms.—Pain which is increased when the part is moved, soreness and more or less swelling.

Treatment.—Rest, with gentle rubbing with alcohol and water. equal parts; tincture of arnica or soap liniment. Later on the rubbing should be more vigorous with gentle kneading of the muscles affected. The application of dry heat by means of hot-water bags or bags filled with hot sand will often give relief from pain and help to "limber up" the part.

STRAINED OR LAME BACK.

This is a very common and distressing condition. It is not always a true sprain, being sometimes due to muscular rheumatism.

Symptoms.—Pain in the lower part of the back or region of the loins which is worse when the patient attempts to get up or sit down, but not so severe when standing, and may entirely disappear on lying down.

Treatment.—That part of the back which is the seat of the trouble should be completely incased in several layers of surgeon's adhesive plaster, so as to form a sort of jacket. The use of the plaster in this way keeps the muscles at rest and gives support.

To apply the dressing, the patient is seated on a stool, all the clothing having been removed from the back, abdomen, and hips. The plaster comes in various widths, which are wound on spools and may be obtained at most drug stores. A 2½-inch spool should be selected for this purpose and cut in lengths long enough to cover the back and extend well forward along the sides—about 18 inches for persons of ordinary girth. The strips are applied firmly to the back and sides, overlapping each other for about an inch along their entire length (fig. 241).

At least three thicknesses of the plaster should be used so as to give good support. The dressing may be worn from two to three weeks or longer.

If there is any suspicion of rheumatism, the patient should be purged for four days and a teaspoonful of baking soda taken in half

FIG. 241.—Method of strapping the back with adhesive plaster.

FIG. 242.—Eversion of the upper lid, step one.

FIG. 243.—Eversion of the upper lid, step two.

FIG. 244.—Improvised eye dropper.

FIG. 245.—Correct method of putting drops in the eye.

FIG. 246.—Method of wringing out a hot compress in a towel to avoid burning the hands.

FIG. 247.—Dislocation of the lower jaw. (From Scudder's Fractures. Courtesy W. B. Saunders Co.)

FIG. 248.—Reduction of dislocation of lower jaw.

a glass of water just before retiring for at least two weeks. Acid fruits, especially oranges and grapefruit, should be avoided and plenty of water drunk.

FOREIGN BODIES IN THE EYE.

Foreign bodies in the eye come under two classes, first those which lodge under the lids and second those which are firmly adherent to the clear part of the eyeball, the cornea, sometimes known as the sight of the eye.

Treatment.—To remove a foreign body from under the lid, first of all determine which lid is affected. To do this, seat the patient on a chair facing a window and pull the lower eyelid down, having the patient look up. If a cinder or other speck is seen, take a clean pocket handkerchief, folded so that it makes a point, and remove the object with the point. Wetting the tip of the handkerchief with clean water will sometimes assist the process of removal.

If nothing is seen on the lower lid, it will be necessary to invert the upper lid. To do this take a match, lay it across the lid, holding it in one hand, grasp the eyelashes with the fingers of the other hand, *have the patient look down* and turn the lid upside down by pulling the lashes up over the match. The lid may be held in this position by the left hand and the foreign body removed with the handkerchief as described above. If it is very firmly embedded, a clean toothpick may be used to loosen it from the flesh.

Removal of foreign bodies which are lodged on the cornea or sight of the eye.—This is sometimes very difficult, as particles of steel are frequently firmly embedded in the eye in this locality. It may be difficult to see them, and a magnifying glass may be necessary for this purpose. Sometimes their presence can be detected by the fact that a few enlarged blood vessels run toward the foreign substance. After the object is seen a very small particle of cotton may be firmly wrapped around the point of a clean toothpick and moistened with clean water. It may be possible, by having the patient look steadily at some object, to hold the lids apart and remove the foreign body in this way. Frequently, however, it will be too firmly embedded to be extracted by this procedure. Such cases require the services of a physician. Pending the arrival of a doctor, both eyes should be closed, small pads of cotton placed over them and a handkerchief tied over the eyes and around the head. This limits the motion of the eyeball and prevents further damage.

If the services of a doctor can not be obtained, put a drop of a 2 per cent solution of cocaine hydrochlorate in the eye. Wait for 15 minutes and then place the patient on his back on a couch or table. A large needle should be passed several times through a flame and

cooled. Endeavor to remove the foreign body from the cornea by carefully lifting it up with the needle. The operator should steady his hand by resting it on the patient's face. The cocaine makes the eye insensitive, so that the patient does not wink or move when the eyeball is touched.

After a foreign body has been removed from the eye it is well to wash the eye out with a saturated solution of boric acid. This may be made by adding a teaspoonful of boric-acid powder to a glass of warm water and stirring until it is dissolved. The solution should be allowed to cool and then one or two drops placed in the eye. If an eye dropper is not available one can be improvised by twisting a small piece of cotton into the shape of a cigar butt, pulling out the small end so that it comes to a fine point (fig. 244). The hands of the operator should be washed and then the cotton dipped in boric acid, and by squeezing the blunt end a drop may be caused to run off of the fine end into the eye.

Dropping medicine in the eye.—Very few people understand the proper method of putting drops into the eye. This of course is best accomplished by using an eye dropper. Only a very small quantity of the medicine should be drawn in the dropper, the bulb being very lightly squeezed. The patient should sit on a chair facing a fairly good light. The dropper should always be held with the point down in the right hand of the operator. Stand in front of the patient, pull down the lower lid, and have the patient look away from the operator and then place 1 or 2 drops on the outer edge of the lower lid. This will run across the eye and wash off the entire surface. The object of the procedure is to have the patient look away and to put the drops not on the eyeball but on the junction of the eyeball and lid (fig. 245). If the patient sees the drop coming he will involuntarily close the lids and the medicine will not get into the eye.

If the patient is alone when the foreign body flies into the eye. he may try to remove it himself with the aid of a mirror. If a mirror is not at hand, and the object is under the upper lid, it can sometimes be dislodged by pulling the upper lid down over the lower. In any event, the eye should not be rubbed, as this does no good and only embeds the object more firmly in the tissues.

NOTE.—Blowing the nose is frequently recommended, but I have never succeeded in removing a cinder from my own eye in this way and I know of no good reason why this maneuver should be effective.

FOREIGN BODIES IN THE NOSE.

Children occasionally slip beans and other similar objects into the nose. The bean may swell, making an effort to dislodge it particularly difficult. Sometimes these bodies may be removed by closing the other side of the nose and having the child blow the nose

vigorously. Another device worthy of trial is to cause the child to sneeze by tickling the nose with a feather. Occasionally, if the object is readily seen, an attempt to remove it may be made by bending a hairpin slightly and attempting to insert the curved end alongside the object, holding the points in the fingers. These cases generally require the services of a physician, and they should always be taken to a doctor in case the simple treatment above described is not successful.

FOREIGN BODIES IN THE EAR.

Various foreign bodies are occasionally introduced into the ears and may be the source of a great deal of discomfort and pain. An insect in the ear may be removed by turning the head to one side and filling the ear with warm sweet oil poured into it by means of a spoon. The oil will suffocate the insect and it will float out. For the removal of other objects a physician should in all cases be employed, as a great deal of harm can be done by inserting sharp instruments into this cavity. Occasionally a small object may be removed by a gentle syringing with warm water.

FOREIGN BODIES IN THE THROAT.

The beginning of the throat is known as the pharynx. Lower down there are two passages, one of which leads to the stomach, called the gullet or esophagus. The other leads to the lungs, and is known as the larynx at the upper end, lower down the windpipe or trachea. Foreign bodies may lodge in any of these passageways. Commonly such objects are articles of food, but other things which have been held in the mouth—like coins, safety pins, or marbles—may accidentally slip back and lodge in the throat. Young children are especially apt to put any small articles which they get into their hands into their mouths, and occasionally they attempt to swallow them, with disastrous results.

Foreign bodies in the pharynx.—Large foreign bodies in the pharynx cause great interference with breathing. They can generally be removed by opening the mouth and pulling the object forward by means of the fingers or by hooking the index finger behind it.

Treatment.—Place the patient on a chair facing the light, open the mouth, and hold the tongue down with the handle of a teaspoon. It may be possible in this way to see the object and to extract it. Inversion can be tried in the case of a child and the same effect produced in an adult by having him lie crosswise on a bed on his abdomen with his head and shoulders hanging over the side. Failing to remove the obstruction in this way, send for a doctor at once.

Foreign bodies in the gullet—Symptoms.—When an object lodges

in the gullet the patient has pain, difficulty in swallowing, and breathing may be interfered with. Occasionally the symptoms may be slight, but more often the object produces inflammation.

Treatment.—The treatment is the same as advised for foreign bodies in the pharynx.

NOTE.—If a child or adult has swallowed some sharp or pointed article like a piece of broken glass or a pin, give him a diet composed largely of mashed potatoes and bread. Encourage him to eat as much as possible of these articles for several days. They will surround the foreign body in large masses and prevent it from injuring the walls of the intestine. Do not give purgatives at once, but after the bread-and-potato diet has been taken for two or three days a mild laxative may be given. Watch the passages carefully for several days to be certain that the object has been passed. Such cases should always be under the care of a doctor when he is available.

Foreign bodies in the larynx—Symptoms.—When a foreign body enters the upper part of the windpipe it immediately sets up a violent attack of coughing which frequently results in its expulsion. A small article may, however, remain in the windpipe and gradually work its way lower to some point in the lung where it remains permanently, causing a continual inflammation characterized by cough, with foul and blood-streaked expectoration. If the object is large it may completely close the passage and prevent the entrance of air to the lungs and threaten death by suffocation. In such cases a patient becomes black in the face and makes frantic struggles to secure air.

Treatment.—If the patient is a child, he should be picked up by the feet and held suspended with the head downward, which may cause the object to fall out by its own weight. Failing in this, if the symptoms are not alarming, endeavor to quiet the sufferer and send for a doctor at once.

RUPTURE OR HERNIA.

Rupture is due to a weakening of some part of the abdominal walls and the escape through the opening of some of the contents of the abdomen, usually a part of the bowel. The bowel, of course, is covered by the skin and some of the other tissues, but forms a larger or smaller swelling at the point of the hernia. The commonest form of hernia occurs at the groin. Hernias in this location frequently can be reduced by the patient when he lies upon his back and properly manipulates the mass.

All persons with weak abdominal walls are liable to hernia, especially elderly people. The direct cause of the hernia is often the strain produced by lifting heavy weights.

Symptoms.—A painful swelling appears in the groin which may disappear when the patient lies down and presses the mass upward

and backward into the abdomen. If the fingers are held in contact with the hernia and the patient gives a cough, a sharp impulse will be felt by the examining finger at the moment of the cough.

STRANGULATED HERNIA.

The great danger of hernia is that the prolapsed bowel may be caught in the opening through which it has escaped in the abdominal wall, and the swelling which takes place causes an increase in the size of the tissues, which finally result in the blood supply being shut off and the prolapsed part of the bowel becomes first inflamed and then gangrenous.

Symptoms.—Pain at the seat of the hernia and also in the abdomen. The mass can not be replaced and is tender to the touch. There is vomiting, which at first is of the ordinary type but later foul smelling, and in odor and appearance resembles the ordinary passages from the bowels. The pulse is rapid and weak and there is great thirst. There are no stools or passages of gas from the anus.

Treatment.—Place the patient in bed and raise the knees on several pillows. Endeavor to return the mass into the abdomen by gentle manipulation, trying to push the part that descended last back first. This maneuver may be assisted by raising the foot of the bed and placing a pillow under the hips so that that part of the body is higher than the chest. Prolonged efforts to return the bowel are dangerous, and if gentle attempts do not succeed, no further manipulation should be tried but a doctor should be sent for immediately. Pending the arrival of the doctor do not permit the patient to take any food.

If the bowel can be reduced by the above manipulation, keep the patient in bed for several days and allow only water for the first 24 hours, gradually permitting small quantities of soft food as time goes on.

If it is certain that a doctor can not be obtained, an ice bag may be applied to the hernia in the hope that this treatment may reduce the inflammation sufficiently to permit the bowel to slip back into the abdomen. If the desired result is not obtained at the end of several hours, remove the ice bag.

Prevention of strangulated hernia.—Operations on hernia nowadays are very successful. It is advisable that all men who have hernias, and whose occupations require that they go on long sea voyages or into the woods or other places where they will be out of reach of competent medical help, should be operated on in order to get rid of the rupture and escape the dangers of possible strangulation in some remote district where suitable treatment can not be obtained.

INJURIES TO JOINTS.

JOINTS.

Description.—Wherever two or more bones come together they form a joint. The joint is surrounded by a closed sac called the joint capsule. This sac contains a slippery fluid, which serves to lubricate the joint and permits the bones to move smoothly. The joint capsule is not sufficiently strong to prevent the bones from being torn apart, so additional strength is furnished to the joint by strong bands of tissue, which are known as ligaments. It will be noted that some joints, such as those in the fingers, move only backward and forward, while other joints, as, for example, the hip joint, will permit of movement in practically all directions.

SPRAINS.

Description.—Sprains are the injuries produced by wrenching or twisting a joint. Sprains of the ankle, wrist, shoulder, and knee are very common. Severe sprains should always be treated by a doctor, if possible. There was an old saying that bad sprains were worse than fractures. As a matter of fact, many of these "sprains" were in reality small or partial fractures near the joint, especially when involving the ankle. In severe sprains of the shoulder, wrist, or ankle an X-ray examination of the affected part should always be made if it is possible to do so. Sprains of the ankle in which extensive areas of black and blue skin are observed, extending for a considerable distance up the leg, are almost always accompanied by fractures.

Symptoms.—Severe pain, always increased by motion of the joint, and hence there is often apparent lack of ability to move the limb. Swelling and sometimes redness, later on possibly discoloration.

Treatment.—Absolute rest to the joint. If at the wrist or shoulder, put the arm in a sling. If a knee or ankle is involved, put the patient in bed and rest the joint on a pillow. Apply cold water compresses, using a thick dressing large enough to wrap completely around the joint and extend well above and below it. Hot-water compresses may be used if more agreeable to the patient. Continue the compresses until the pain and swelling subside. This may require from two to five days. Then cautiously begin rubbing with alcohol diluted with an equal amount of water or tincture of arnica. Later, in addition to the rubbing, which should become gradually more vigorous, begin gently moving the joints by grasping the hand or foot and moving it in various directions. These motions should be made by the operator and not by the patient. The injured person

should exercise great caution in beginning to use the part. In recent years severe sprains and strains which resisted ordinary treatment have sometimes been greatly benefited by being baked in dry air at a very high temperature. This treatment, however, requires special apparatus and skilled supervision, hence is not available for home use.

Sprains of the ankle joint are often treated by strapping with adhesive plaster. Cold compresses should be used for four or five days, and when the swelling is somewhat reduced the plaster may be applied. For this purpose take strips about an inch wide and apply them snugly to the sides of the ankle running around the heel and to the sides of the foot encircling the heel. The method of application can be best understood from studying figure 311. Be sure, however, to leave a strip of skin which is not covered by the plaster extending all the way up the front of the foot and ankle. The whole limb must not be encircled by the plaster. Plaster applied in this fashion makes in reality a flexible splint and gives considerable support to the joint. It can be worn for three or four weeks if necessary.

Physicians very frequently use plaster of Paris casts in the treatment of severe sprains. In the case of the ankle, the joint should be thoroughly protected by some resilient material such as a woolen bandage, a smoothly applied layer of cotton batting, or a couple of thicknesses of cotton stocking. The cast is applied from just behind the toes to a little above the middle of the calf. Great care should be taken in putting the cast on that the circulation is not obstructed, and the toes should be frequently examined in order to be certain of this point. If pain follows the application of the cast, or the toes become blue or dark, the cast should be immediately removed.

DISLOCATIONS.

Description.—When one of the bones is forced out of its proper place in a joint and remains permanently out, the injury is known as a dislocation. These accidents tear or stretch the ligaments, and even if properly treated the joint is apt to be weak afterwards and will slip out of place more easily a second time. The shoulder joint is more frequently dislocated than any other joint in the body.

Causes.—Dislocations are usually the result of falls or severe accidents.

Symptoms.—Pain, inability to move the joint in the usual manner, the appearance of the joint differs from the sound one on the other side, the end of the displaced bone may be felt to be in an improper position when compared with its uninjured fellow, and swelling may occur shortly after the injury has been received.

First-aid treatment.—Always send for a physician if one is available. Pending his arrival apply cold water compresses to the joint and put the part at rest by placing the arm in a sling if it is in the upper extremity or by having the patient lie down and rest the injured member on a pillow if the accident has happened to the lower extremity. This is all that need be done until the arrival of the surgeon under ordinary circumstances. It is difficult to reduce most dislocations, and considerable harm may be done by inexperienced persons in their attempts to do so.

There are two joints, however, which are very often successfully treated by the laity when dislocated and in which attempts at dislocation are not accompanied by danger. These are dislocations of the lower jaw and finger.

Dislocation of the fingers.—Dislocation of the fingers often occur from the results of injuries received in playing baseball.

Treatment.—The dislocated finger should be grasped firmly by the operator, and the end which is out of place should be pulled straight away from the hand. It will then usually slip into place. Cold compresses should be applied for a day, and the hand carried in a sling to prevent undue swelling and inflammation.

NOTE.—Do not attempt to reduce a backward dislocation of the thumb at the joint where it joins the hand.

Dislocation of the lower jaw.—Dislocation of the jaw is not an infrequent accident and is sometimes due to opening the mouth too widely as in yawning. The patient presents a peculiar appearance, the jaw hanging down and the victim being unable to close the mouth (fig. 247). Speech, of course, is interfered with. Either side of the jaw may be dislocated or both.

Treatment.—Place the patient in a chair with his head against the back. The operator stands behind the patient and places the right thumb, wrapped in a towel to protect it from injury, far back in the right side of the patient's mouth and rests it on the back teeth. The left hand grasps the chin with the palm upward (see fig. 248). Next press the back end of the jaw down with the thumb inside the mouth and then the bone can be pushed backward into place by means of the left hand on the chin. The hands are reversed and the left side treated in the same manner. When the bone goes into place the jaw will snap shut with considerable violence, and care must be taken to protect the finger which is within the mouth.

After reduction the jaw should be bandaged (fig. 204) and only soft food permitted for several weeks.

Dislocation of the shoulder.—As has already been stated this is the most frequent dislocation in the body.

Symptoms.—The shoulder on the affected side does not look like the other (fig. 249). For making this inspection the patient should

Fig. 249.—Dislocation of the shoulder. (From Scudder's Fractures. Courtesy W. B. Saunders Co.)

Fig. 250.—Reduction of dislocation of the shoulder, step one.

Fig. 251.—Reduction of dislocation of the shoulder, step two.

Fig. 252.—Reduction of dislocation of the shoulder, step three.

FIG. 253.—Reduction of dislocation of the shoulder, step four.

FIG. 254.—Emergency dressing for dislocation of the clavicle; pad under arm.

FIG. 255.—Emergency dressing for dislocation of the clavicle; arm bound down to side.

FIG. 256.—Emergency dressing for dislocation of the clavicle; sling applied.

be stripped to the waist and seated on a stool, the operator standing exactly in front and behind him to compare the two sides. The two shoulders should also be gently examined by feeling them with the hands. If the hand of the affected arm can be placed on the opposite shoulder, and while the hand is in this position the elbow brought to the side of the chest, the shoulder is not dislocated. The arm can only be moved slightly at the shoulder joint, and such attempts produce great pain. The patient will usually support the injured member with the other hand because the weight of the arm increases the pain.

Treatment.—If a surgeon can be obtained within four hours, make no attempt at reduction, but place the patient in a comfortable position and apply cold compresses to the shoulder.

If a doctor can not be secured within four hours it is generally proper to attempt to reduce.

Method of reduction.—Place the patient on the ground or a couch. Grasp his wrist with one hand and the elbow with the other. Gradually bring the elbow against the side and hold it there, then swing the wrist forcibly outward with the right hand (fig. 251). Hold it in this position and bring the elbow upward and inward across the body toward the middle line as far as it will go (fig. 252). Holding it in this position swing the forearm inward across to the other side of the chest (fig. 253). These motions should be made slowly and with deliberation. Considerable patience may be required to overcome the muscles, which are in a state of spasm on account of the irritation due to the injury.

If an attempt is made to reduce the dislocation, do so immediately, as the longer the bone is allowed to remain out of position the more difficult it will be to replace it. In case one careful effort does not succeed do not attempt further manipulations of this sort, but await for qualified surgical aid. Treat the joint with cold compresses as directed for sprains. After the bone has been replaced bandage the arm to the side with the hand almost on the opposite shoulder (fig. 256). Keep it in this position for seven days and then remove the bandage and move the arm gently in various directions (passive motion). After the motion put the arm in the original position and replace the bandage. Perform passive motion every day for a week. Then place the arm in a sling, permitting slight voluntary motion. After three weeks the patient may begin to use the arm with moderation.

Dislocation of collar bone or clavicle.—The collar bone runs from the breast bone to the shoulder and can be easily felt beneath the skin. It may be dislocated at either end.

Symptoms.—Pain and more or less inability to use the arm. The patient may be unable to raise the arm over the head. The dislocated

end of the bone can sometimes be felt in an unnatural position. Compare it with the opposite side. The affected shoulder is lower than the other. There is no crepitus.

First-aid treatment.—Place a pad in the armpit of the injured side and hold in place with two strips of muslin going over the opposite shoulder. Fasten the arm to the side with a bandage or strips running around it and the body. Apply a wide sling which supports and raises the point of the elbow (fig. 256).

After treatment.—Remove the clothing to the waist and place the patient on a stool. Stand behind him and grasp the shoulders. Place the knee against the back between the shoulder blades and draw the shoulders backward. Have an assistant at the same time endeavor

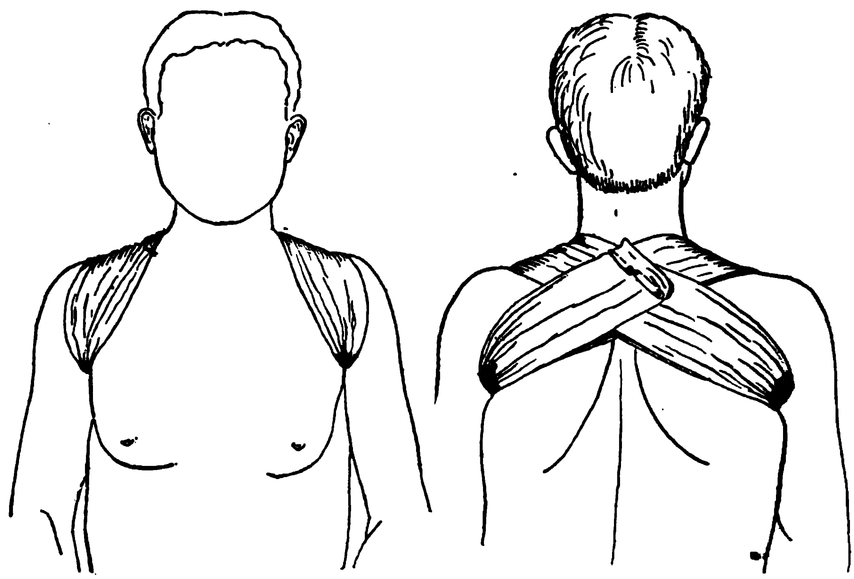


FIG. 197.—Figure of eight of the shoulders.

to push the end of the bone into its proper place. Apply a compress over the seat of the injury and hold the shoulders back with a figure eight bandage to the shoulders (fig. 197). Support the arm and elbow with a sling which pulls the point of the elbow upward. If possible, keep the patient in bed for three weeks with this dressing in place. After three weeks remove the dressing and allow patient to get up. Some deformity will almost always follow a dislocation of the clavicle, but a useful arm may be expected notwithstanding.

All other dislocations.—No attempt should be made to reduce dislocations of other parts than those described except by a physician, as great injury may be done by injudicious handling, and it is much better to wait even for a number of days until qualified help is obtainable. All these dislocations, however, should be treated with cold compresses and the part kept at rest by appropriate measures.

Shock may be present in dislocation of the larger joints, and this should be borne in mind and suitable treatment applied if it is present.

FRACTURES.

The bones constitute the framework of the body and serve to give it rigidity and form. They also perform a useful function in protecting important organs, such as the brain, heart, and lungs. The bones are quite strong and are capable of withstanding considerable force, but if sufficient stress is applied in the right direction, they will first bend a little and then finally break. The bones of children are much more elastic than those of adults or old persons.

When a bone does break the fractured pieces are generally sharp and jagged (fig. 257). Their rough or pointed ends may do great damage to the flesh, especially if the broken limb is moved around carelessly. Every effort should therefore be made when fractures are received to prevent the sharp edges of the bones from tearing the muscles or even coming out through the skin.

Broken bones are known as fractures and are very common injuries. Fractures are generally produced by falls or direct violence, such as a squeeze or crush.

VARIETIES OF FRACTURES.

When the bone is broken and there is no wound, the injury is known as a *simple fracture*. If the skin is broken and there is a wound leading down to the ends of the bone, it is called a *compound fracture*. The student should remember that a compound fracture, then, is one in which the fracture is compounded by a wound. A *compound* fracture is *not* a fracture in which the bone is broken in more than one piece without a wound. Such fractures are called *comminuted* fractures. Briefly, then, a *simple* fracture is one without a wound, a *compound* fracture is one with a wound. The distinction between these two varieties of injury is very important, because. while most simple fractures unite without difficulty or grave symptoms, compound fractures, on the other hand, on account of the open wound frequently become infected with pus germs. Active suppuration follows, which involves the bone, and a long time is required for recovery. Hence, compound fractures are very serious injuries and may even at times prove fatal. Every effort should therefore be made to prevent a simple fracture from becoming compound. As above explained, if the patient is carelessly moved, a sharp bit of bone, as shown in figure 258, may be easily forced through the flesh and skin and the simple fracture be converted into a compound fracture by injudicious handling. To prevent this accident splints or some sort of appliance should always be placed around broken bones before the sufferer is moved.

SYMPTOMS OF FRACTURE.

Simple fracture.—There is the history of an injury and the part is painful and tender when touched. There is loss of function; that is, the part can not be moved to as great an extent as before. All attempts at motion produce great pain. There may be visible deformity and the limb may be shorter than the uninjured one on the other side. It may be possible to feel the break by running the fingers along the bone. False motion may be detected; that is, the arm or leg bends at a place where there is no joint. It is not safe to assume that because a man can move his arm or leg that it is not broken. Men have been known to walk on a broken leg.

Crepitus or grating.—This is a peculiar rasping sensation which can sometimes be detected in fractures when the ends of the bone are slightly moved, somewhat similar to that experienced by rubbing the ends of a broken clay-pipe stem together, while holding them in the fingers. The grating is felt by the hands manipulating the bones and is rarely heard. Any one of these symptoms, except the pain, may be absent. The shortening when it is present is due to the fact that the muscles attached to the bone are always under tension, like stretched rubber bands, and if the break is complete and the ends free to move they will tend to pull the broken pieces by each other, thus shortening the limb.

Impacted fractures.—This name is applied to injuries where the broken ends of the bones are driven into each other. Such fractures are most common near the heads of larger bones where the bone is porous and the broken surfaces extensive in area. Many of the symptoms of ordinary fractures are absent in impacted fractures, but there is often considerable deformity, especially in impacted fractures at the wrist.

There are three positive signs of fracture. These are, first of all, crepitus; second, unnatural motion, that is, bending where there is no joint; and third, shortening. An inexperienced person should not deliberately attempt to produce crepitus, but the characteristic grating sensation may be felt when one is supporting the part or adjusting it on a splint. The grating sometimes felt in moving a joint must not be mistaken for the crepitus of a fracture. It may be impossible to tell whether false motion is present or not if the break is near a joint. Finally, shortening may be deceptive because this also occurs in certain dislocations, hence great care must be exercised in determining that the shortening is in the bone itself and not a shortening of the limb due to the escape of the head of a bone from its socket.

In case a man has received an injury and fracture is suspected, there being great pain, more or less loss of motion, possibly numb-

ness in the fingers or toes, it is always wiser in first-aid work to assume that there is a fracture present and treat the case accordingly until medical help is available. Splints can be improvised almost anywhere and it will do no harm to put the injured member on a splint and take the patient to a physician even if there is actually no fracture, whereas if there is a fracture and this precaution is omitted great damage may result, because an unprotected simple fracture may be converted into a compound one during the journey.

X-rays.—The application of X-ray pictures as a guide to the treatment of fractures has been a most important advance in medicine. Where there is any doubt concerning a bone injury or an injury to the joint, the X-ray should be used, if it is available, to clear up the diagnosis. X-ray pictures should always be made of fractures in or around the joints. It should be always remembered, however, that X-ray examinations show merely shadows and that considerable skill and experience is necessary to interpret them correctly.

First-aid treatment of simple fracture.—Before taking up the treatment of fractures it is necessary to describe emergency splints.

When a fracture is suspected, lay the limb on a folded blanket, coat, pillow, or other flat, soft object while splints are being prepared.

Splints are used to prevent motion of the ends of the broken bone while the patient is being transported, and later on to hold the fragments in proper position and prevent motion while they are healing. Union can not take place if there is motion at the seat of a fracture.

Emergency splints can always be devised from some material at hand. Light boards from broken boxes make excellent splints. Two or more pieces may be nailed together in order to get one strip of sufficient length. Heavy corrugated pasteboard is frequently used, also sections of tin gutters and properly shaped strips of tin. Other articles which suggest themselves are fence pickets, laths, umbrellas, canes, rifles, and even bundles of twigs. The material selected should be sufficiently rigid to support the weight of the limb and hold it immovable.

The splints must be padded on the side which goes next to the flesh, as otherwise they are extremely painful and may seriously damage the skin. Cotton is the best material for padding, but other substances such as waste, pieces of old cloths or quilts, excelsior, straw, grass, moss, etc., may be used. Special attention should be given to padding the end of the splint which will come against the body. Splints should be wide enough to give firm support; in the case of a forearm or leg, as wide as the part itself. Emergency splints can be applied over the clothing, which will help to cushion them and protect the part.

Applying splints.—In applying splints great care must be exercised in moving or handling the injured part. Both fragments of the broken bone must be supported when it is lifted or its position changed. When one splint is in place endeavor to overcome obvious deformity and get the part into a natural position by a very gentle manipulation. Then adjust the other splint and fasten them to the limb.

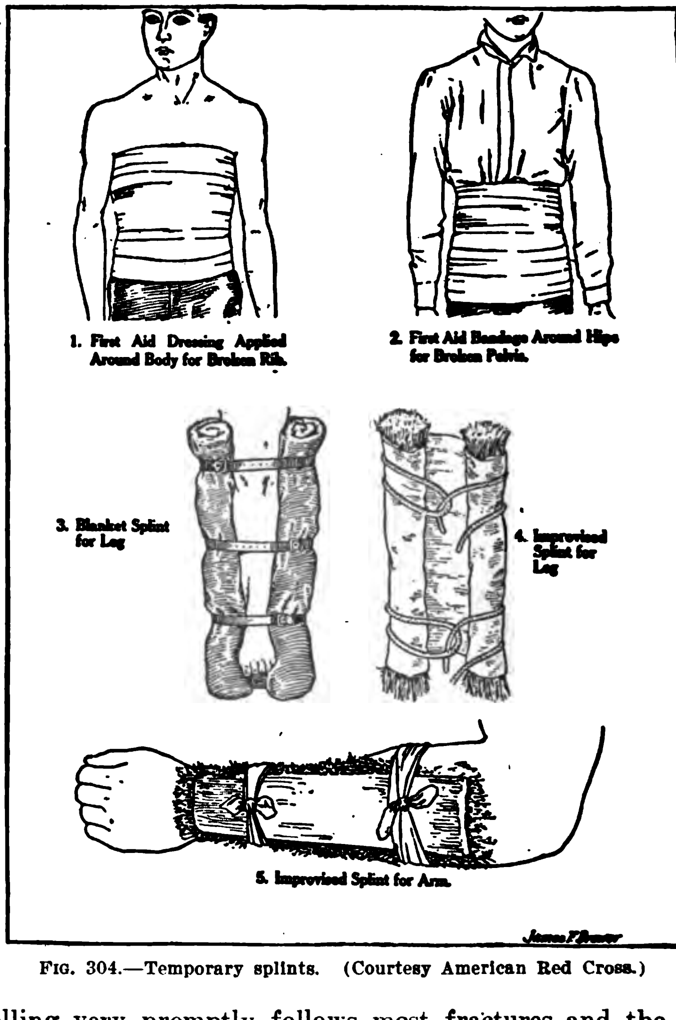


FIG. 304.—Temporary splints. (Courtesy American Red Cross.)

Swelling very promptly follows most fractures and the limb is very painful and tender to touch. If the swelling is marked it is customary to remove the emergency splint as soon as the patient arrives home or at the hospital and to place the limb on a pillow and apply cold-water compresses or compresses of leadwater and opium for three days. Lead and opium wash is prepared by taking

FIG. 257.—Simple fracture. (From Fowler's Surgery. Courtesy W. B. Saunders Co.)

FIG. 260.—Plaster cast for fracture of the leg. (From Scudder's Fractures. Courtesy W. B. Saunders Co.)

FIG. 258.—X-ray picture of fracture of both bones of the forearm, showing sharpness of fragment. (From Da Costa's Surgery. Courtesy W. B. Saunders Co.)

FIG. 259.—Emergency splints for fracture of the forearm.

FIG. 261.—Dressing for fracture of the finger; splint fastened in place with strips of adhesive plaster. A bandage may be placed over the completed dressing.

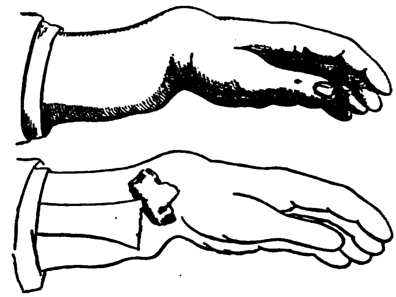


FIG. 262.—Fracture of the wrist, showing characteristic deformity. (From Da Costa's Surgery. Courtesy W. B. Saunders Co.)

FIG. 263.—Dressing for fracture of the wrist (1). (From Scudder's Fractures. Courtesy W. B. Saunders Co.)

FIG. 264.—Dressing for fracture of the wrist (2). Note the position and the amount of padding, and that the upper splint is cut out for the ball of the thumb. (From Scudder's Fractures. Courtesy W. B. Saunders Co.)

one-half of an ounce of tincture of opium and one-half of an ounce of liquor plumbi subacetatis. These two are mixed together and then this mixture is added to a pint of water, making the well-known leadwater and opium. This solution is much used in the treatment of bruises, sprained joints, and recent fractures where the skin is not broken. Gauze, towels, or similar material are rung out in the fluid and applied in the same manner as wet dressings. The remedy is poisonous, however, and should be kept out of the reach of children and never taken internally. After the swelling has somewhat subsided the permanent splints are applied. It is advisable to reduce the fracture and apply the permanent splints as soon as possible, because the longer this is postponed the more difficult it will become to get the bones into proper position.

Permanent splints.—Permanent splints are made of wood, metal, or plaster of Paris. When plaster of Paris bandages are used the dressing is called a plaster cast. Permanent splints must be very thoroughly padded, especially the ends. When the splint is manufactured at home the padding may be held in place by a piece of muslin which goes around the splint and is fastened by small tacks on the outside somewhat in the way the lid of a box is upholstered. A many-tailed bandage is useful in holding padding in place. Wooden splints should be as light as possible and cut and shaped to fit the part. Splints are worn from four to six weeks. When they are first applied the part should be carefully watched, as swelling may be developed and cause pressure of the splints against the flesh, followed by ulceration or even gangrene. The fingers or toes should be examined several times daily at first to determine that the circulation is not impeded.

To apply this test press on the finger tip or toe firmly with the finger of the observer. Remove the pressure suddenly and a white spot will remain, but should quickly disappear if the circulation is all right. If the white spot fades away slowly, or if the fingers are blue, the splint should be loosened. Never apply a bandage around a limb under a splint. Splints will gradually work loose and get out of proper position. This should be borne in mind and the bandages reapplied or the splints readjusted whenever necessary.

When the splints are taken off permanently the limb will be found to be stiff and painful when motion is attempted. It should be rubbed or massaged daily with grain alcohol or whisky. If a joint near the fracture is stiff, gentle passive motion should be begun, gradually increasing the amount and scope of the movements from day to day. Broken limbs in adults are often painful and more or less impaired for usefulness for six months and even longer.

PLASTER OF PARIS CASTS.

It is customary nowadays for surgeons to treat many fractures with plaster of Paris casts. These casts are made of coarse crinoline bandages impregnated with ordinary dry plaster of Paris. The limb is protected by drawing a stocking over it, covering it with a woolen bandage, or a smooth layer of cotton batting. The plaster of Paris bandages are placed in a basin of cold water and allowed to remain until they are thoroughly wet, which is indicated by the cessation of bubbles of air arising from the roll. The bandage is then smoothly applied around the limb over the stocking or other material which has been placed around it to act as a cushion. During the process of application additional plaster of Paris, made by mixing it with water to the consistency of thin cream, is well rubbed into the bandage by the hands of the operator. The limb should be carefully supported while the cast is being applied by one or more assistants, and great care exercised that the broken bones are held and kept in the proper position until the plaster has thoroughly set and the cast is firm enough to permanently hold the bones in proper position. The thickness of the cast will depend upon the part to which it is applied. Light casts are sufficient for the hand or wrist, but much heavier ones must be used on the thigh or leg. The cast should be as light as possible, but must be sufficiently rigid to hold the fragments of the bone immovable in the correct relation to each other.

Before starting to apply a cast the floor and bed should be well protected with newspapers and the operator and assistants by suitable gowns or aprons, as considerable soiling of the surroundings with the plaster is unavoidable, especially in inexperienced hands. A solution of ordinary sugar in water will materially assist in getting the plaster off of the hands of the operator.

Plaster casts are generally removed by splitting them up the front with a small saw or scissors especially made for that purpose. In the absence of regular instruments they may be divided by the cautious use of the point of a jackknife, care being taken not to cut the flesh underneath. The flannel bandage or cotton wadding which was first placed around the limb is a great protection to the part in cutting off the cast.

Setting a bone.—As soon as the injury has been received and splints prepared efforts should be made to restore the bones to their natural position. This is called setting the fracture. It is easier to set a fracture immediately upon its receipt than after an interval of several days has elapsed, because the pain and swelling which gradually develop after the bone has been broken will materially interfere with its reduction. Inexperienced persons in endeavoring to set fractures

should use gentleness and not continue the effort too long. The reduction may be assisted by pulling on the limb in such a way as to overcome the shortening. No layman should ever attempt to set a fracture unless it is certain that it will be absolutely impossible to obtain a physician for a considerable period.

When the ends of the bones have been pulled apart cautious effort should be made to gently press them back into their proper place. Frequently the deformity will recur as soon as the pressure is removed. Attempts may be made to keep the bones in place by putting soft pads at suitable places between the splints. Efforts at reduction should not be carried too far, and the operator should be content with getting the limb in nearly as natural a position as possible. Fractures around the joint are apt to be followed by stiffness of the joint. If stiffness of the elbow is to be feared, the arm must be always placed in a position which leaves the arm and forearm at right angles, because a stiff joint in this position is very much more serviceable than one when the arm is fully extended. In the case of the knee, however, the leg should always be kept perfectly straight, as a stiff knee joint in this position is very much more useful than one which is partly flexed.

TREATMENT OF SIMPLE FRACTURES OF SPECIAL PARTS.

Fractures of the fingers—Symptoms.—It is generally possible to obtain crepitus by gently rotating the ends of the fingers.

First-aid treatment.—All that is necessary is to place the hand in a sling pending medical attention.

After treatment.—Make a light wooden splint of cigar-box wood or similar material the width of the finger and long enough to extend from the end of the finger well into the palm. Pad and apply (fig. 261). Keep the splint on for three weeks, and keep the hand during this period in a sling to avoid bumps and jars.

Fracture of the bones of the hand—Symptoms.—Usually crepitus can be detected by carefully manipulating the suspected bone.

First-aid treatment.—Place the hand in a sling. The other bones will act as a splint.

After treatment.—Lay the hand on a splint which extends from the ends of the fingers half way up the wrist. Pad it well and place a large ball of padding where the palm will rest. Lay the hand and forearm on the splint and put it in as good a position as possible. Fasten the hand to the splints with a roller bandage or a many-tailed bandage. Then place the hand in a broad sling. Keep the splint in position for three weeks, beginning passive motion of the fingers at the end of the second week.

Fracture of the wrist.—This is very often produced by a fall on a slippery pavement, the patient striking the ground with the palm of the hand in his effort to save himself.

Symptoms.—Marked deformity (fig. 262) and numbness of the fingers.

First-aid treatment.—No splint will be required in most cases, it being sufficient to place the arm and hand in a broad sling. If the patient is to be transported for some distance, it will be well to make a trough about 6 inches long of heavy cardboard, tin, or many thicknesses of newspaper, line it with some soft material, and place the wrist in this trough, binding it lightly with several handkerchiefs or strips of muslin. The trough, of course, is placed in the sling, which is wide enough to support the hand and forearm.

After treatment.—Attempt to reduce deformity by cautious manipulation. Efforts at overcoming deformity can sometimes be assisted by pushing the hand backward into the position it was when the injury was received and then pushing the base of the hand forward so that the lower fragment of the bone comes into the proper position when the hand is bent forward while maintaining traction in the axis of the limb. Apply cold-water dressings for several days, keeping the hand and arm in a sling, if swelling is very marked. After swelling has subsided, put the arm up in a permanent dressing. Make two splints of light wood about 3½ inches wide. One of these goes on the under side of the forearm when the palm is turned upward, and should be long enough to run from near the elbow to the beginning of the fingers. This splint is well padded and the forearm laid on it, palm upward, with a pad under the wrist (fig. 263). The upper splint should extend from 2 inches below the bend of the elbow to about the end of the palm. This splint should be cut out on the thumb side to make a place for the ball of the thumb (fig. 264). Put plenty of padding at the lower end of the splint (fig. 264). Fasten the splints in place with adhesive plaster or strips of bandage. Do not apply them too tightly. Place the forearm in a wide sling with the palm toward the body and the thumb up, but the fingers hanging loose outside of the sling (fig. 267). At the end of a week, take off the upper splint and use the lower one only, holding it in place with a bandage (fig. 265). Apply passive motion to the fingers. Remove the remaining splint at the end of three weeks and support the forearm in a sling, using passive motion to fingers and wrist. At the end of the fourth week allow patient to begin to use hand.

FRACTURES OF FOREARM.

The arm extends from the shoulder to the elbow; the forearm from the elbow to the wrist. There are two bones in the forearm. Either one of these bones may be broken or both. When only one

FIG. 265.—Lower splint to be used alone at the end of first week in fracture of the wrist. (From Scudder's Fractures. Courtesy W. B. Saunders Co.)

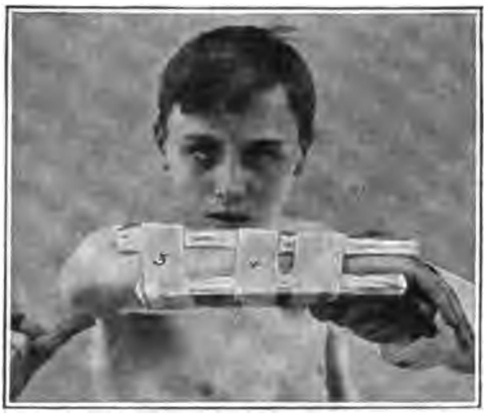


FIG. 266.—Dressing for fracture of both bones of the forearm. (From Scudder's Fractures. Courtesy W. B. Saunders Co.)

FIG. 267.—Sling for fracture of both bones of the forearm. (From Scudder's Fractures. Courtesy W. B. Saunders Co.)

FIG. 268.—Jones's position for dressing all fractures near the elbow joint except fracture of the tip of the elbow.

FIG. 269.—Wedge-shaped pad to go in the armpit for fracture of the arm.

FIG. 270.—Showing pad and splints in position for fracture of the arm. The splint in the rear does not show.

FIG. 271.—Completed dressing for fracture of the arm. Note that a narrow sling is used to support the hand.

bone is broken the other acts as a splint and the symptoms of fracture may not be clear. In cranking an automobile, if the motor backfires the crank will be violently whirled around in the reverse direction and frequently causes fracture of the forearm of the operator.

Symptoms of fracture of both bones of the forearm.—Pain, inability to turn palm upward and downward, possibly grating, false motion.

First-aid treatment.—Bend the forearm to a right angle with the arm. Apply two padded emergency splints extending from the elbow to the knuckle. Lay the forearm and the hand on the lower splint, gently straighten the part as well as possible, and place the other splint on the back of the hand and arm. Fasten in place the bandage or strips of muslin and support the arm and hand in a broad sling.

After treatment.—When the patient is in bed remove emergency splints, place arm and forearm on a pillow, try to restore bones to their natural position, and apply cold compresses for several days. When swelling is reduced make two splints of light wood about 3½ inches wide and long enough to run from the elbow to the knuckle. Pad the splints well and apply to the forearm as directed above. Fasten the splints with strips of adhesive plaster, straps, or a bandage (fig. 266). Lay arm across the body with the thumb up in a broad sling (fig. 267). Keep the splints on for four weeks. Passive motion should be begun after three weeks, removing the splints daily for that purpose.

FRACTURES AROUND THE ELBOW JOINT.

Some surgeons treat all fractures around the elbow joint, either above or below, except fracture of the tip of the elbow (the olecranon) by Jones's position. The arm is bent at the elbow, placed against the side and the hand of the affected side held at the base of the neck by a bandage fastened around the wrist and suspended from the neck (fig. 268). This mode of dressing injuries around the elbow joint is extremely simple and recommends itself to the laity on that account. It is necessary, however, to observe certain things. After the hand has been placed in the proper position and fastened there with the dressings, the operator must be certain that he can feel the pulse at the wrist. It is also necessary to examine the arm daily for the first 10 days. If the swelling is growing worse the hand should be lowered a little. If the pulse can not be felt at the wrist it is necessary to lower the hand until such a point that the pulse returns. The arm is held in this position for from three to six weeks. At the end of the first two weeks the wrist is lowered an inch or so. At the end of three weeks the dressing should be taken off daily and a little passive motion applied very cautiously.

Considerable padding must be applied around the neck in order to prevent the pain which the weight of the arm will cause to that part of the body unless this precaution is carried out. A leather band around the wrist or a glove from which the fingers have been removed may also be utilized as a means of holding the hand in the desired position, the glove or leather band being fastened to the neck bandage by suitable strips.

FRACTURE OF THE ARM.

Fractures of the arm are common, but it is sometimes difficult to get union.

Symptoms.—Pain, shortening, inability to move the arm, and sometimes crepitus and false motion may be detected. The appear-

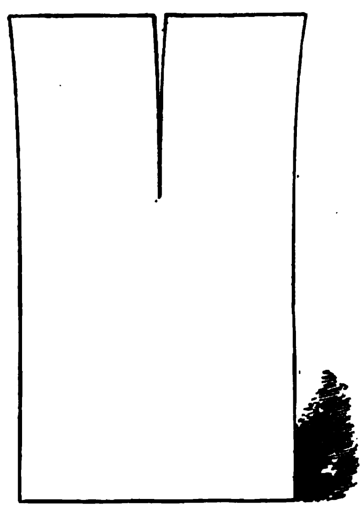


FIG. 272.—Method of cutting cardboard for shoulder cap.

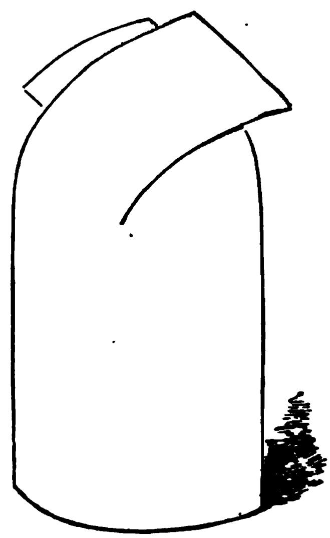


FIG. 273.—Shoulder cap made.

ance of black and blue spots on the arm after an injury in places which have not been bruised themselves should suggest the likelihood of a fracture.

First-aid treatment.—Place a broad wedge-shaped pad between the chest and the arm long enough to extend from the arm pit nearly to the elbow. The edge of the wedge goes into the armpit (fig. 269). This pad may be constructed of towels or even folded newspapers wrapped in some soft material. It is held in place by a band or strips going over the opposite shoulder. The pad gives a firm straight surface to support the arm on the inside. Apply three short narrow padded splints to arm running from the shoulder to the elbow, one on the outside, one behind, and one in front (fig. 270).

Hold the splints in place with a many-tailed bandage, or three strips of muslin. Fasten the arm to the chest with a bandage going around the rest of the body or with strips of adhesive plaster or a towel pinned in place. Place the forearm in a sling and use a narrow sling supporting the wrist only (fig. 271).

After treatment.—For after treatment use the same dressings and splints more carefully applied, that is wedge-shaped pad between the arm and chest, three splints around the arm. Bring the forearm up so that it makes a right angle with the arm. Fasten the arm to the side by bandages and support forearm in a narrow sling at wrist. Allow splints to remain on for five weeks, frequently adjusting them and the bandages. A narrow sling is advisable here because it allows the weight of the forearm to help in overcoming shortening.

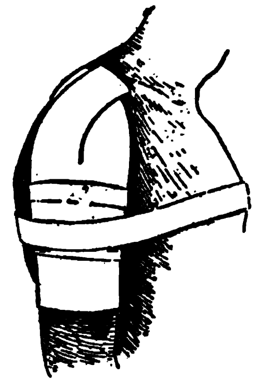


FIG. 274.—Shoulder cap applied.

In fractures near the shoulder joint, a shoulder cap should be applied in addition to the other dressings. The cap can be constructed of binder's board which has been softened in hot water, or heavy pasteboard (figs. 272, 273, 274). The binder's board should be long enough to run about halfway down the arm and wide enough when shaped to the arm to about half encircle the part.

FRACTURE OF THE SKULL.

Fracture of the skull may occur at the top or vault of the skull, or the lower part, when they are known as fractures of the base of the skull.

Fractures of the skull are serious injuries and may be due to blows, falls, or other accidents.

Fracture of the upper part of the skull can often be felt by running the finger over the scalp, the depression in the bone being easily detected. The gravity of fractures in this location depends largely on the damage done to the brain and blood vessels. If large arteries have been ruptured inside the skull the blood pours out and compresses the brain giving rise to symptoms of brain compression (p. 289).

Fractures of the base of the skull.—Fractures of the base of the skull are generally compound, the wound not being visible, but in the nose, pharynx or ears. They are of course very dangerous injuries.

Symptoms.—There may be partial or complete loss of consciousness, bleeding, or the escape of blood-stained fluid from the nose or ears and paralysis of the face. Later the symptoms of compression may be developed such as paralysis, slow stertorous breathing, unequal pupils, etc. (p. 289).

First-aid treatment.—Send for a doctor at once. Raise the head on a pillow or folded coat. Treat shock by applying hot-water bottles, jugs filled with hot water, or hot bricks around the feet and body. Be careful not to burn an unconscious patient. *Do not give whisky or other stimulants.*

After treatment.—Place the patient in bed with the head elevated. Apply an ice bag to the head. An ice bag may be improvised by putting pieces of cracked ice in a piece of oil cloth, part of a rubber coat or similar waterproof material. Apply heat to the extremities as directed above. Do not give stimulants.

If there is a wound in the scalp, dress the wound with sterilized gauze or other material and apply an ice bag. If there is no wound of the scalp cold may be applied to the head by means of towels rung out in cold water and frequently changed. If the patient can not pass his urine naturally, it may be necessary to boil a soft-rubber catheter and draw the water by inserting it into the urinary passage. Before doing this the operator should carefully and thoroughly clean his hands.

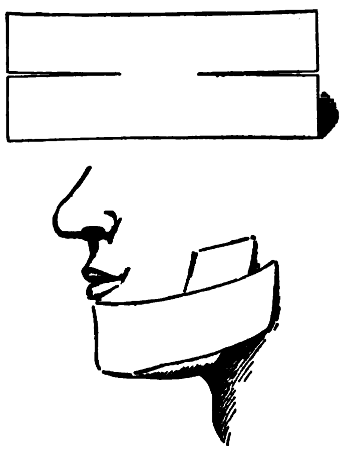


FIG. 275.—Method of making a splint for fracture of the lower jaw out of a piece of moistened cardboard.

FRACTURE OF THE NOSE.

Symptoms.—Pain, swelling, hemorrhage from the nose and deformity.

First-aid treatment.—Nothing special is required unless it becomes necessary to check hemorrhage. Attempts may be made to mold the nose into proper shape or position by the fingers. Fractures of the nose should always be treated by a physician when one is available.

FRACTURE OF THE LOWER JAW.

Fracture of the lower jaw is often due to a blow from the fist or a kick in the face when the individual is lying on the ground.

Symptoms.—Pain, the teeth may be out of line and it may be possible to detect unnatural mobility, or crepitus, when the jaw is firmly grasped on each side and gentle motion in various directions attempted.

First-aid treatment.—Apply a four-tailed jaw bandage (fig. 217). If there is much bleeding in the mouth it may be washed out with water as hot as it can be borne, or a piece of ice may be held in the mouth.

After treatment.—Do not remove loose teeth. Put the jaw into its natural position, using the fingers inside the mouth for this purpose, if necessary, then apply a small compress of gauze to the chin and hold jaw in place with a four-tailed jaw bandage (fig. 218). In cases of compound fracture a good deal of discharge may occur and the mouth become foul. When this happens it will be necessary to use mouth washes. Sometimes the broken fragments may be held in place by wiring the teeth with fine wire. The bandage should be worn for five weeks and only liquid food allowed. This may be introduced through a tube inserted between the cheek and teeth. The mouth should be frequently washed out with a solution of a heaping tablespoonful of boric acid powder to a pint of water.

FRACTURE OF THE COLLAR BONE.

Fracture of the collar bone is frequently due to a fall in which the person strikes with the weight on the hand.

Symptoms.—The patient generally supports the injured arm with the other hand. It is easy to detect a fracture of the collar bone, because the bone is placed directly under the skin and the deformity may be seen or felt. Always compare with the other side. Stand behind the patient with his clothing removed and grasp the collar bone on each side between the fingers. Make gentle motion. It will be found that the bone on the injured side can be moved and on the other side it is rigid.

First-aid treatment.—Make a pad of towels, newspaper, or other flexible material and place in between the arm and the side in the armpit. Keep the pad in position by straps going over the opposite shoulder. Bind the arm to the side by bandages, a towel, or strips of muslin, and then make a sling which specially supports the point of the elbow so as to raise the elbow up.

After treatment.—The best form of treatment, if it is necessary for an inexperienced person to assume charge of the case, is to put the patient in bed with a small pillow or a large pad between the shoulders and place a bag of sand over the point of the fracture. The forearm should be placed on the front of the chest and the arm held to the side by bandages, running around it and the body, or by pinning a towel around it and the body. Keep in bed for three weeks.

FRACTURE OF THE RIBS.

These injuries are often due to kicks in the side from heavy boots with the person lying on the ground. They may, however, be due to direct violence of all kinds.

Symptoms.—Pain which is likely to be sharp and stabbing, when the patient takes a deep breath or when he coughs. It may be possible to detect unnatural motion in a broken rib by carefully running along its course from the backbone to the breastbone and making pressure. Crepitus and grating can sometimes be felt when the hand is held over the seat of injury and patient coughs, or when one of the broken pieces is pressed inward.

First-aid treatment.—Wrap a strip of muslin or a towel around the chest tightly and pin it. Support with straps running over the shoulders (fig. 276).

After treatment.—If the chest is very hairy, shave it, then place the patient on a stool with the clothing removed to the hips. Strap the affected side firmly with strips of adhesive plaster running from well over the backbone behind, around the affected side and across the breastbone in front. Cover one side of the chest completely with these strips, each overlapping the other for about half their width (fig. 277). The strips should be $2\frac{1}{2}$ inches wide. Have the patient empty the chest of air at the moment each strip is being applied. In the absence of adhesive plaster pin a towel tightly around the chest, supporting it with straps over the shoulders, as described in the first-aid treatment.

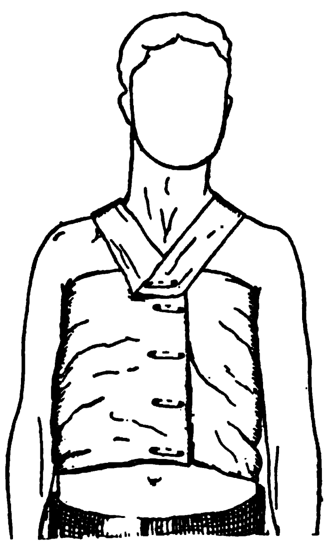


FIG. 276.—Temporary dressing for fractured ribs.

BROKEN NECK OR BACK.

Contrary to common belief, it is possible for a person with a broken neck or back to recover and live for many years. These injuries, however, generally severely damage the spinal cord, which is inclosed in the backbone, and more or less permanent paralysis results.

Symptoms.—Inability to move the legs. Loss of feeling in the members which are affected. If a severely injured person who is conscious can not move his legs, always suspect fracture of the back.

First-aid treatment.—The first-aid treatment of a broken back is very important, for if the injury is high up and the patient is roughly moved, the sharp edges of the broken bones may crush or compress the spinal cord to such an extent that instant death results. Therefore, if circumstances permit, do not move the patient at all pending the arrival of a doctor. If it is impossible to secure a physician, the patient should be lifted or moved only on a blanket or sheet supported at the four corners and the sides.

Fig. 277.—Strapping the side for fracture of the ribs.

Fig. 278.—Method of changing a sheet, step one. One side of the clean sheet is rolled up preparatory to putting it on the bed.

Fig. 279.—Method of changing sheet, step two. The patient is shown lying on his right side on a blanket for the sake of clearness. The blanket is rolled up against him and the new sheet is placed so that the rolled-up edge is against the rolled-up blanket.

FIG. 280.—Method of changing a sheet, step three: The patient is turned on his left side, going over the two rolls in the process. He is now resting on the clean sheet and the blanket may be withdrawn and the sheet spread out over the rest of the bed.

FIG. 281.—Method of measuring length of the limb in fracture of the thigh.

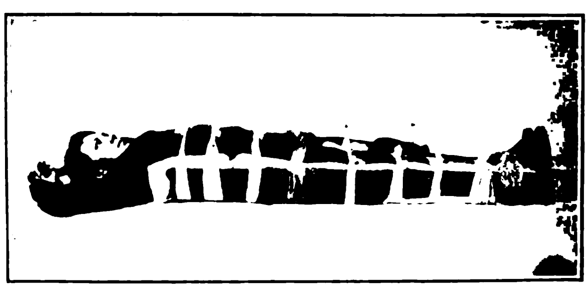


FIG. 282.—Emergency dressing for fracture of the thigh.

METHOD OF CHANGING OR PLACING A SHEET UNDER A VERY SICK OR INJURED PERSON.

It is important to know how to change a sheet under a very sick or injured man with the least amount of disturbance to the patient.

Remove the pillow. Turn the patient gently on his right side. The old sheet is now rolled up into as small a bulk as possible, beginning at the edge toward the operator and the roll continued until it is snugly up against the back of the patient (fig. 278). The new sheet is spread on the floor and the edge toward the patient is rolled up in a similar fashion until a little less than half the width of the sheet has been used. The new sheet is then placed on the bed with the rolled side against the roll of the old sheet (fig. 279). The unrolled part of the new sheet is straightened out and tucked in place at the head and foot of the bed. The patient is now gently turned on his left side, the body rolling over the folded parts of both sheets. The rolled up parts of the sheets will now be again toward the back of the patient, but he will be resting on his left side on the clean sheet (fig. 280). The old sheet is then taken away and the rolled up part of the new sheet is undone and the sheet smoothed out and tucked into place. The patient now turns onto his back and the change is completed.

The same method is used in placing a sheet or blanket under a man with a broken back. He is then lifted by raising the corners and sides of the sheet onto a stretcher or other appliance for transportation.

The litter used for carrying such a case should be made out of boards or other rigid material in order to insure against any likelihood of permitting the backbone to be bent or disturbed while the patient is being carried. It is necessary, of course, to pad such a stretcher liberally with a number of blankets, a mattress, or similar material.

After treatment.—Patient should be kept in bed and made as comfortable as possible. If incontinence of urine and feces results, as is sometimes the case, a rubber sheet should be placed over the mattress and especial care exercised to prevent the formation of bed sores. The back and buttocks should be frequently washed with soap and water, the skin dried with a soft towel, and a mixture of equal parts of alcohol and water or whisky or brandy dabbed on with a pledget of cotton. A good dusting powder should be used, such as talcum, or if this is unobtainable ordinary cornstarch makes a good substitute.

FRACTURES OF THE LOWER EXTREMITIES.

The thigh extends from the knee to the hip and the leg from the knee to the ankle.

FRACTURE OF THE THIGH BONE.

Symptoms.—If the ends of the bone are driven together, as they sometimes are, especially near the hip joint, the symptoms may be very slight, and it will be difficult for the inexperienced to tell whether there is a fracture or not. All fractures in the middle part of the bone will give the following symptoms:

Pain, inability to stand on the injured leg, shortening, and it will be noted that the toe on the affected side falls out. When it is placed in its natural position it again drops in a helpless manner. It may be possible to detect crepitus. Shortening is determined by carefully measuring the leg on each side with a tape measure or a string. The patient should be lying with his legs straight with the body. Feel around the front part of the haunch bones or pelvis until two bony prominences are detected in a similar location on each side (fig. 281). Mark these spots with a little ink. In the same way mark the two most prominent bony prominences on the inner side of the ankle, which can easily be felt through the skin. Now measure the distances between these two points on each side. In fracture of the thigh there may be anywhere from an inch to 3 inches of shortening.

First-aid treatment.—Apply a long splint on the outside of the affected leg extending from the heel to the armpit. Pad it on the side toward the body. Apply another splint on the inside of the leg, extending from the crotch to the heel. Fasten these splints by at least three strips of muslin or similar material around the body and five around the leg and thigh (fig. 282). These strips should be placed under the patient before the splints are applied. In lifting the thigh for this purpose have one assistant carefully support both ends of the broken bone and another the foot when the broken extremity is lifted from the ground. The leg should be carefully lifted by one person when the patient is being placed on a stretcher. Treat shock if it is present.

After treatment.—Place the patient on a hard mattress and put two boards under the bed spring with their ends resting on the sides of the bed to keep it from sagging in the middle. Make an extension apparatus made out of a long strip of adhesive plaster. This strip should be about 3 inches wide and long enough to extend from the break down one side of the leg 6 inches beyond the heel, and up again on the other side to the point of injury. A piece of wood about 3½ inches long and 3 inches wide, with a hole in the middle, is fastened exactly in the middle of this strip of adhesive plaster on the sticky side. It may be held in place by a short strip of adhesive which goes over it. This strip should be about 18 inches long. In this manner a stirrup or spreader is constructed in the center of the adhesive, which prevents it from touching the heel when the strip is

FIG. 281.—Extension apparatus for fracture of the thigh applied. (From Fowler's Surgery. Courtesy W. B. Saunders Co.)

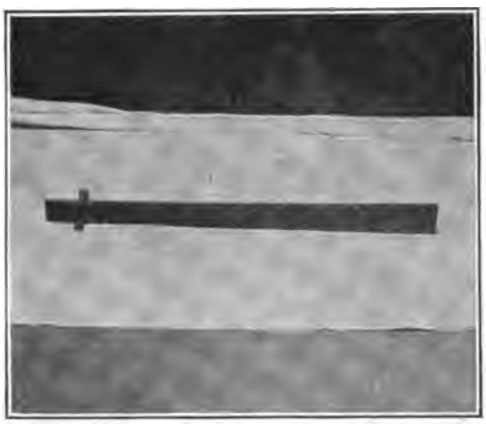


FIG. 286.—Long splint for fracture of the thigh with cross strip near bottom to keep it from turning.

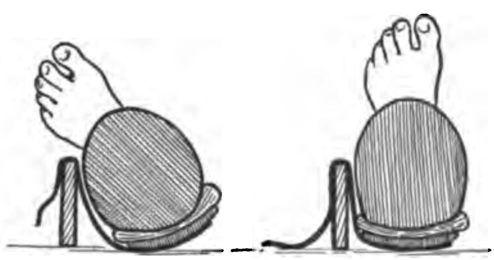


FIG. 287.—Method of preventing eversion of the toe in fracture of the thigh by fastening a strip of adhesive plaster to the back and inner side of the leg and carrying it over the long side splint. (From Scudder's Fractures. Courtesy W. B. Saunders Co.)

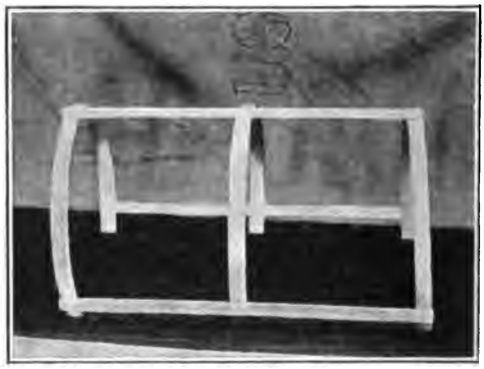


FIG. 288.—Framework constructed of hoops to support bed clothing for a patient with a broken leg or thigh.

FIG. 289.—Improvised bedpan.

FIG. 290.—Showing construction of improvised bedpan.

pulled upon (fig. 283). The adhesive-plaster strip is split in three pieces to within a foot of the spreader and is applied to both sides of the thigh and leg from the injury down to the ankle (fig. 284). The apparatus may be reinforced by several circular strips of plaster, but these should not completely surround the limb for fear of shutting off the circulation (fig. 285). A bandage is applied over the plaster. The adhesive plaster is allowed to set for about an hour. A

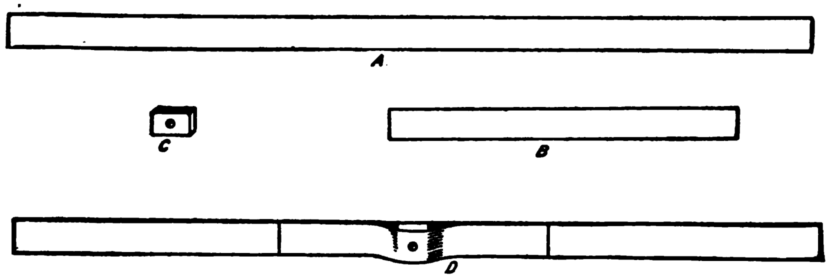


FIG. 283.—Method of constructing apparatus for fracture of the thigh. (A shows the long strip of adhesive plaster; B shows the short strip; C is the block of wood 4 by 3 by ½ inches with a hole in the center; D shows the block placed between the two strips of plaster, all ready for application to the leg or thigh.)

rope is then passed through the block and knotted at the end nearest the foot. This rope is laid over a pulley fastened to a board attached to the foot of the bed. In the absence of a pulley, the rope may be run over a round piece of wood. Weights such as bricks or bags of sand are fastened to the loose end of the rope so that the pull comes on the leg. A bucket containing sand or pebbles makes a good weight.

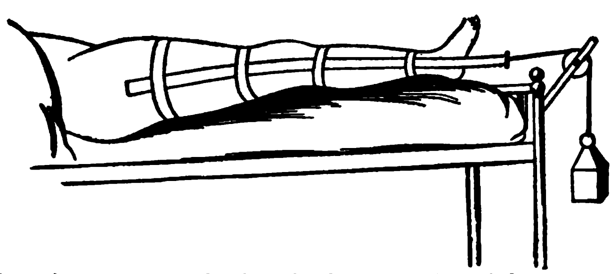


FIG. 285.—Extension apparatus showing circular strips for reinforcement; also weight applied. The circular strips should not completely surround the limb.

To prevent the patient from sliding down on the mattress the foot of the bed is elevated on blocks or boxes from 6 to 10 inches high. Start with about an 8-pound weight and gradually add additional weight until the injured leg is the same length as the other. Now apply a long splint, running from the armpit to below the heel on the outside. This splint should have a light piece of board nailed to the lower end on the under edge to prevent it from turning inward or outward (fig. 286). Another splint is placed on the inside of the leg, extending from the crotch to the heel. Both splints should be well

padded. Long bags of sand about 4 inches in diameter will assist in keeping these splints in place. Care should be taken to avoid the dropping out of the toe, and this should be overcome by suitable pads placed between the foot and the splint. A very good way to avoid the toe dropping out of position, as suggested by Dr. Scudder, is to fasten a strip of adhesive on the inner side of the leg, pass it under the leg, then run it over the splint and attach to the outside of the splint (fig. 287). In fractures of the thigh and leg it will be necessary to improvise some sort of device to prevent the bed covering from weighing down the foot and interfering with the action of the apparatus. This may be constructed out of barrel hoops or light strips of wood (fig. 288). If the bones appear to bulge forward in the middle of the thigh, a short splint, well padded, can be fastened to the front of the thigh over the bulging. The dressings and the foot should be examined twice a day in order to see that everything is in proper position. Liberal padding should be placed under the heel and also under the knee joint. The patient should remain in bed with the splints applied for from 8 to 10 weeks. The amount of weight may be lessened at the end of the sixth week and the splints occasionally removed and passive motion applied to the knee joint. The pulley should be so adjusted that the cord supporting the weight is in a line with the limb.

If adhesive plaster can not be obtained, an extension apparatus of some value may be improvised out of a shoe. Secure, if possible, a shoe one or two sizes larger than ordinarily worn. Cut two slits about an inch long on each side of the shoe just above the sole under the instep. Pass a strap through these holes. Put two or three pairs of heavy woolen socks on the foot and then apply the shoe. Lace it up snugly, and extension may be produced by fastening a rope to the loop of the strap under the sole of the foot and applying weights to the other end of the line running it over a pulley if possible, as directed for the ordinary apparatus.

It is advisable to give a patient who has received a fracture of the thigh or leg 10 grain doses of sodium bromide in water after meals and at bedtime for the first four or five days. The bromide helps to allay pain, overcomes muscular spasm, and produces sleep. Confinement in bed is very irksome to these patients at first, and the medicine helps to tide them over until they have become accustomed to it.

It will be necessary for the patient to use a bed pan, and if one is not at hand a substitute of some sort must be constructed. Receptacles for this purpose may be improvised in various ways. One method is to take a shallow pan and to construct a low framework of wood in which the pan is inserted so that there is a smooth wooden rim about 2½ inches wide around the pan and flush with its top on

FIG. 292.—Double incline plane for fracture of the upper part of the thigh bone. (From Fowler's Surgery. Courtesy W. B. Saunders Co.)

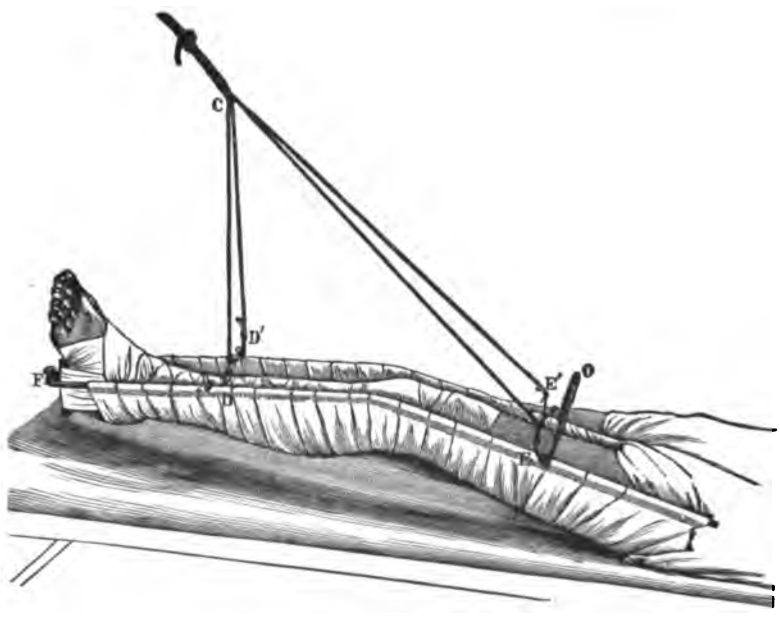


FIG. 293.—Hodgen's splint for fracture of thigh (1). (From Stimson's Fractures and Dislocations. Courtesy of Lea & Fabigler.)

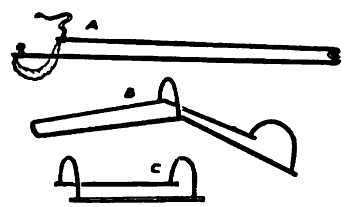


FIG. 294.—Thomas wire splint. (From Blake & Bulkley. Courtesy Surgery, Gynecology and Obstetrics.)

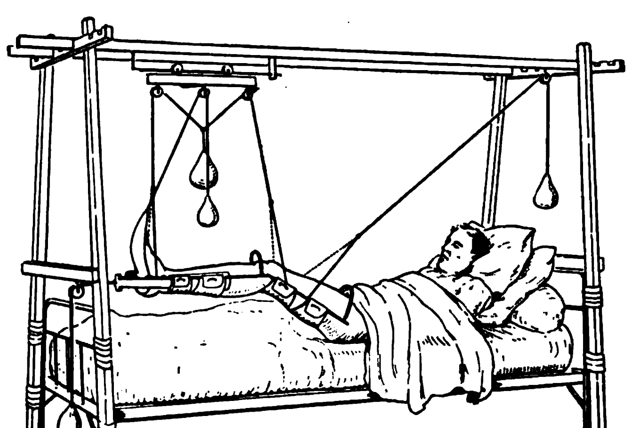


FIG. 295.—Hodgen's splint with overhead extension apparatus. (From New York Medical Journal.)

which the patient rests. The framework keeps the pan from upsetting. Pending the securing of some convenience of this sort the bowel discharges may be received on pads of oakum, old newspapers, or similar material.

There are many ingenious and complicated appliances for treating fractures of the thigh, but they are scarcely within the scope of a manual of this sort.

The double incline plane (figs. 291, 292) is very often used for fractures of the thigh near the hip joint. A good idea of how this apparatus is constructed can be obtained from examining the illustrations. The plane itself is made of boards, and it should be thoroughly padded. The extension apparatus has to stop at the knee,

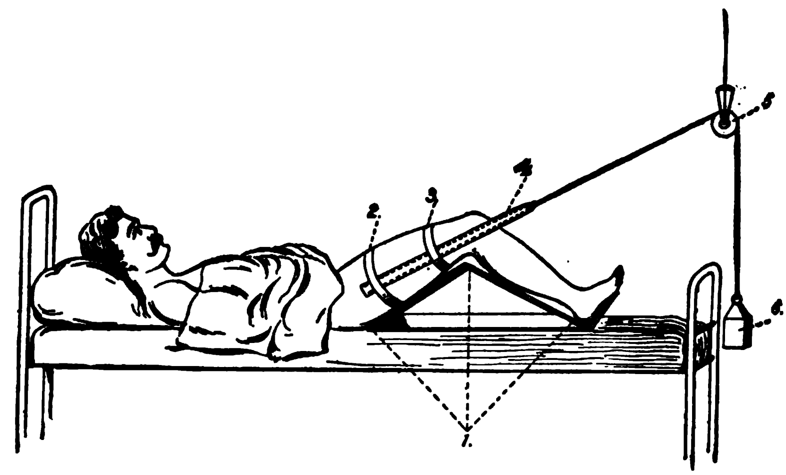


FIG. 291.—Shows a double-incline plane with the weight and pulley—1 is the double-inclined place, 2 and 3 are circular pieces of adhesive plaster to prevent 4, the longitudinal strip on each side of the thigh, from slipping; 5 and 6 are the pulley and weight.

and on account of its shortness it is sometimes difficult to keep in place.

All fractures of the thigh are more conveniently treated if the limb can be suspended in some manner. This makes it very much easier to place a bed pan under a patient and also permits of considerably more freedom of the body in the bed. A very popular splint which fulfills these requirements is a sort of suspension cradle made of two iron rods running along the sides of the limb and held together by cross bars at their upper and lower ends. Strips of bandage or light canvas are fastened across the bars and the limb rests in the hammock thus formed. The whole apparatus is then supported by cords passing over pulleys fastened to a beam above the bed (figs. 293, 295). Some form of extension is, of course, used with these splints.

When a patient is to be transported for a considerable distance a Thomas wire splint (fig. 294) has proven very satisfactory, especially in injuries received on the battlefield. The extension in figure 296 is made by means of canton-flannel strips attached to the leg by glue, as described in the note below, counter-extension by a ring around the upper part of the leg. Sufficient traction should be placed upon the flannel strips to bring the ends of the broken bone into proper position, and the strips should then be wound around the bottom of the splint, after pushing the ring firmly against the hip to insure the broken bones being kept in this position. Care should be taken to put plenty of cotton around the ring at the upper part of the splint, and the position of this ring should be slightly changed each day and the skin dusted with talcum powder to keep it from becoming chafed.

NOTE.—In case adhesive plaster can not be obtained a very satisfactory means of extension can be devised by gluing suitable strips of canton flannel or similar material to the sides of the leg, the apparatus in all other respects resembling that constructed out of adhesive plaster (fig. 284). The glue for this purpose is preferably made according to the following formula:

Common glue, 50 parts; water, 50 parts; glycerin, 2 parts; thymol, 1 part; calcium chlorid, 1 part.

This is painted on the skin warm, in a direction opposite to that in which traction is to be made to avoid the discomfort of pulling the hairs. Such an extension apparatus will hold for 10 days or longer, and if it becomes loose a new one can easily be reapplied. In cases of emergency it would probably be possible to use a simple mixture of equal parts of glue and water, adding the proper amount of glycerin, however, if it is obtainable.

FRACTURE OF THE KNEE CAP.

Symptoms.—The patient can not stand and is unable to raise the limb from the ground. Very often separation of the two pieces of bone may be felt by the fingers if the case is examined before swelling has set in (fig. 297).

Treatment.—Make a splint about 3 feet long and 4 inches wide. Pad it well and place it under the thigh and leg. Fasten it in place with a number of handkerchiefs, strips of muslin or a bandage.

After treatment.—The aim of the treatment is to force the two ends of the broken bone together and keep them in place. This is difficult. A strip of adhesive may be applied just above the upper fragment and then brought downward and attached to the splint so as to pull the fragment down. A similar strip is passed across the lower fragment and attached farther up to the splint to pull the lower

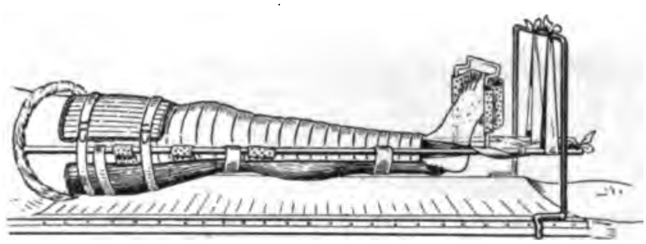


FIG. 296.—Extension by means of Thomas splint. (From New York Medical Journal.)

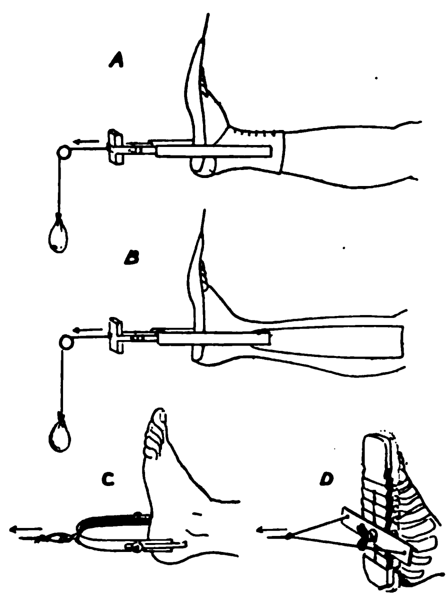


FIG. 297.—Methods of applying extension in fracture of the leg. (From Blake & Bulkley. Courtesy Surgery, Gynecology and Obstetrics.)

FIG. 298.—Fracture of the kneecap. (From Fowler's Surgery. Courtesy W. B. Saunders Co.)

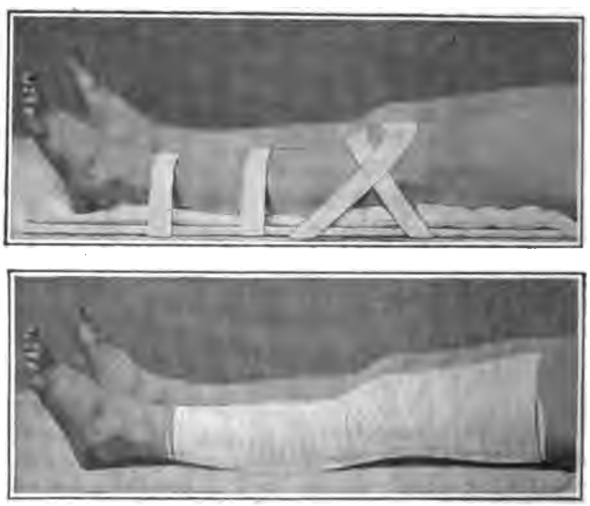


FIG. 299.—Fracture of the kneecap dressed with adhesive plaster. (From Fowler's Surgery. Courtesy W. B. Saunders Co.)

fragment up (fig. 299). Handkerchiefs may be applied in the same manner (fig. 298). The splint should be elevated at its lower end to relax the muscles of the leg. The restraining bands around the knee cap should be tightened every few days in order to take up slack. The splint should be worn for about six weeks, the patient, of course, remaining in bed. It may be replaced by a short splint and a firm bandage, which should be worn for at least a month. Stiff joints are very apt to follow fracture of the knee cap.

FRACTURES OF THE BONES OF THE LEG.

The leg extends from the knee to the ankle joint and contains two bones. The larger bone of the leg is called the tibia. The other bone is long and slender and placed to the outer side, called the fibula.

Either or both of the bones of the leg may be broken. If only one bone is fractured the other acts as a splint and it may be difficult to make a correct diagnosis of the injury.

FRACTURE OF BOTH BONES OF THE LEG.

Symptoms.—The patient is unable to stand. There is generally deformity and false motion. Crepitus may be detected.

First aid treatment.—Apply two well-padded splints to the sides of the legs extending from well above the knee to below the heel. Fasten in place with five strips of bandage or muslin (fig. 300). If a pillow is available, lay the leg on the pillow. Bring the sides of the pillow up around the leg and tie them in place with strips of muslin or bandage. A folded blanket may be used in place of a pillow. Two side splints may be now placed, without padding, on the outside of the pillow or blanket (fig. 302). If no other appliances are available, the injured leg may be fastened to the other leg with strips of bandages or handkerchiefs, the sound limb acting as a splint.

After treatment.—Place the patient in bed and lay the leg upon a pillow covered with a pillowcase, the end of the case being at the foot. Bring the sides of the pillow up around the leg and hold in place with four straps or strips of muslin. Place pieces of towel over the shin bone where the straps cross the leg to prevent pressure. Slip three thin boards between the pillows and the straps, one underneath, the other two at the sides (fig. 302). Pin the ends of the pillowcase around the foot. Leave the leg in this dressing for 10 days, tightening the bands and rearranging the pillow as necessary so as to insure that the ball of the big toe, the inside of the ankle joint, and the inside of the knee are in the same vertical plane. Then apply a plaster of Paris cast. The leg should be covered from the

toes to above the knee with two long cotton stockings, an even layer of cotton batting, or a smoothly applied flannel bandage. The cast should extend from above the knee down to the toes. (See directions for applying plaster of Paris casts on p. 250.) Great care must be exercised in having the assistants support the broken bones in the proper position while the cast is being put on and until it has hardened. The foot must be at a right angle with the limb; and the ball of the big toe, the middle of the ankle joint, and the inside of the knee must be on the same vertical plane. From four to six 3-inch bandages will be required to make a dressing of sufficient strength for the proper results. The cast should be applied firmly, but not so tightly as to shut off the circulation. This can be tested by examining the condition of the toes as described on page 249. If they become blue or dark, the cast must be cut off. This dressing is worn for four weeks, when the patient may be allowed up, using crutches for two weeks and a cane for two weeks longer.

If plaster of Paris bandages are not available, at the end of 10 days put the foot in a fracture box, which is best understood by consulting figure 303. When the foot is in the fracture box be careful to get sufficient padding under the heel and under the toes to keep the foot vertical with the leg and to prevent excoriation of the flesh. The fracture box should be suspended about 2 inches above the box by ropes running from both ends of the box to a bar suitably supported above the bed. Keep the foot in the box for four weeks, then let the patient up, using crutches for two weeks and a cane for two weeks longer.

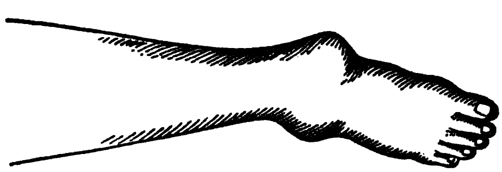


FIG. 305.—Shows the appearance of the right foot after a Pott's fracture.

POTT'S FRACTURE.

A fracture of the outer bone of the leg—that is, the fibula—a few inches above the ankle is known as a Pott's fracture. It is a very common injury.

Symptoms.—The foot points outward and there is unnatural motion at the ankle joint.

First-aid treatment.—The same as described above for fracture of both bones of the leg.

After treatment.—Put the patient in bed and lay the leg on a pillow. Overcome the deformity as well as possible. The foot must be turned in and held in that position. It may be necessary to apply cold compresses for three or four days to reduce swelling. Then apply a straight splint, specially padded, to the inner side of the leg,

FIG. 300.—Emergency dressing for fracture of the leg. Two side splints padded with underclothing and fastened with neckties, handkerchief, and stockings.

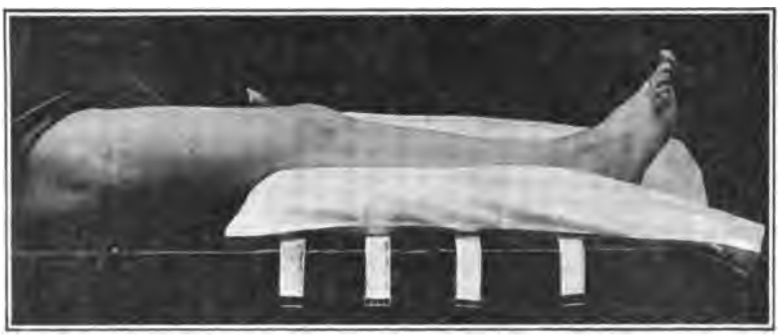


FIG. 301.—Fractured leg dressed with a pillow and side splints, step one. (From Scudder's Fractures. Courtesy W. B. Saunders Co.)

FIG. 302.—Fractured leg dressed with a pillow and side splints, complete, with straps and towels, to prevent pressure on the front of leg. (From Scudder's Fractures. Courtesy W. B. Saunders Co.)

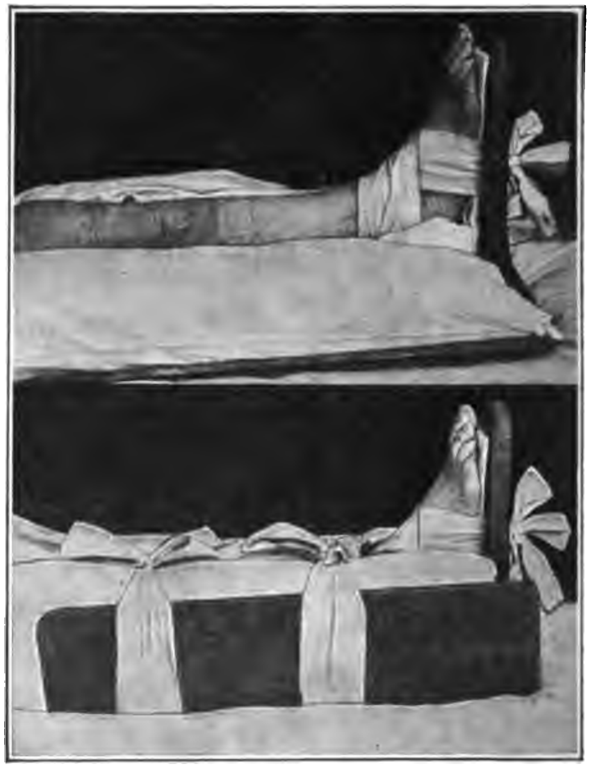


FIG. 303.—Fracture box for fracture of the leg with pillow and pad under the heel and foot. (From Da Costa's Surgery. Courtesy W. B. Saunders Co.)

FIG. 306.—Dressing for Pott's fracture. (Fracture of the fibula near ankle joint.) Note the length of splints, straps, and amount of padding. (From Scudder's Fractures. Courtesy W. B. Saunders Co.)

which extends from above the knee to well above the heel. The method of applying this splint and the padding is best understood from examining figures 306 and 307. Note carefully that it is necessary to turn the foot strongly in by bandages or appropriate strips of muslin (fig. 307). The splint should be worn for five weeks and then the patient may be allowed to walk on crutches for a week, using a cane after that.

FRACTURES OF THE BONES OF THE FOOT.

These are usually due to direct force and are often compound.

Symptoms.—There is a great pain in the foot on attempts to walk and crepitus may be produced on gently manipulating the injured bone.

First-aid treatment.—The other bones act as splints and usually nothing will be required except to lay the foot on a pillow.

After treatment.—Put the patient in bed, apply cold compresses for several days to reduce swelling. Then reduce any obvious deformity and apply a splint of thin wood or heavy pasteboard to the bottom of the foot. The sole of the shoe is used as a pattern in cutting out the splint. Pad it and bandage in position, leaving the toes out in order to observe the circulation. The dressing should be worn for four weeks.

FRACTURES OF THE TOES.

First-aid treatment.—A light splint may be applied to the sole of the foot, but usually no splint will be necessary.

After treatment.—The injured toe may be bandaged to the adjoining toe or a light splint may be applied which covers the entire sole. The dressing should be worn for three weeks, during which time the patient does not walk on the affected foot.

COMPOUND FRACTURES.

Compound fractures have already been described as fractures which are complicated by wound extending down to the broken bones. It is possible to break a bone and receive a wound of the skin or a wound in some other part of the limb, but if the wound does not communicate with the fracture it is not a compound fracture.

Symptoms.—The symptoms are the same as those of any other fracture, with the addition of the wound (fig. 308). In severe cases the end of the broken bone may come through the wound and project on the outside.

First-aid treatment.—The great aim of the treatment of compound fractures is to prevent bacteria getting into the wound. If pus germs gain admission there will be a great deal of swelling and inflamma-

76912°—19——22

tion and finally suppuration. The healing of the fracture will be prolonged for many weeks and sometimes there is so much destruction of the bone by inflammatory processes that healing does not take place at all until surgical measures are employed. Therefore, in a compound fracture, always cover the wound with a sterile dressing at the earliest possible moment. After the wound has been covered, splints may be applied as in the manner already described. In case a sterile dressing is not available, the wound should be allowed to remain exposed to the air while one is being prepared. A suitable dressing made of muslin or toweling may be folded into shape and boiled, as described on page 186. After this dressing has been placed on the wound and fastened in place then apply the splints.

If one of the bones is sticking out through the flesh, the question arises as to whether it is wise to attempt to restore it to its natural place. If a doctor can be obtained in a short time, make no such effort, but apply the dressing over the open wound and prevent further motion of the fragments as well as may be with the splints. If the patient will have to be transported for a considerable distance before he can reach medical help, it may be proper to attempt to replace the bone by pulling on lower end of the limb in the direction of its long axis. Before doing this, in all cases the wound and the protruding end of the bone should be thoroughly painted with tincture of iodine and all visible dirt removed from the bone, so as to lessen as much as possible the danger of dragging live bacteria into the deeper tissues. If tincture of iodine is not available, do not attempt to replace the protruding fragments.

After treatment.—The after treatment of a compound fracture consists in removing the temporary splints and dressings and endeavoring to free the wound from germs by swabbing it with one-half strength tincture of iodine very thoroughly and with great care, working the iodine into all parts of the wound. The operator should especially prepare his hands before undertaking this task, and every precaution should be taken against accidentally contaminating the wound while it is being cleaned or dressed. If the bones are protruding, they must be very thoroughly treated with iodine before efforts are made to replace them in their proper position. If particles of dirt can be seen either in the wound or on the bone, they must be removed preferably by rubbing them off either with the swab or small rolls of sterile gauze. After the wound and a wide area of the surrounding skin has been painstakingly treated with the iodine as above described the bone should be set and the wound dressed with sterile gauze. When the wound has been securely covered, proper splints are applied, but leaving them open in such a way that it is possible to re-dress the wound without dis-

FIG. 307.—Dressing for Pott's fracture, complete. Note the method of turning in foot by fastening bandage to slots in the bottom of splint. (From Scudder's Fractures. Courtesy W. B. Saunders Co.)

FIG. 308.—Compound fracture. (From Da Costa's Surgery. Courtesy W. B. Saunders Co.)

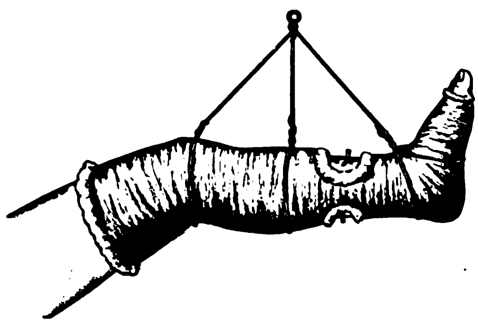


FIG. 309.—Plaster cast for compound fracture. (Cast has two openings, and a drainage tube is inserted through the leg. Provision is also made for suspending the leg. (From Da Costa's Surgery. Courtesy W. B. Saunders Co.)

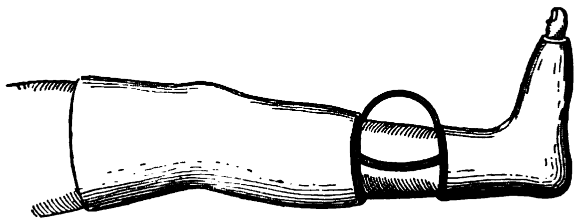


FIG. 310.—Plaster cast for compound fracture reinforced with strips of metal. (From Da Costa's Surgery. Courtesy W. B. Saunders Co.)

FIG. 311.—Strapping sprained ankle with adhesive plaster. (From Da Costa's Surgery. Courtesy W. B. Saunders Co.)

turbing the splints. Plaster of Paris bandages, with windows cut in them or divided into two parts which are held rigid by means of loops of wire or strips of metal, are the dressings usually applied by surgeons (figs. 309 and 310). The dressings on the wound must be changed as often as they become soaked with wound discharges. Iodoform gauze is an excellent dressing for compound fractures. If the wound is stitched or otherwise closed, a wick composed of about a dozen strands of boiled threads should be inserted into the bottom of the wound and left there to assist in the drainage. If the wound does not become inflamed this can be removed after 48 hours. If the wound does become inflamed, the wick must be left in longer. A piece of a boiled soft-rubber catheter makes an excellent means of drainage and should be used instead of the wick if it is available.

If a doctor can be obtained in three or four days, devote most of the treatment to the wound, resting the part on a pillow in the meantime and keeping it in as good position as possible with light splints. Wet compresses must not be applied to compound fractures at first, as they will greatly increase the chances of inflammation.

The diet of a patient with a compound fracture should be light but nutritious, using milk and eggs freely if they are obtainable. If inflammation and much discharge sets in, treat the wound according to the principles laid down under the treatment of inflamed wounds (p. 194).

EFFECTS OF HEAT AND COLD.

SUNBURN.

Sunburn is a red and painful condition of the skin due to exposure of the surface of the body to the rays of the sun.

Treatment.—Make a lotion as follows: Take one-half a pint of hot water and stir into it a level tablespoonful of boric-acid powder; then add 20 drops of carbolic acid, and shake well. The solution should be dabbed on the inflamed skin with a small piece of cotton or sprayed on with an atomizer. It should not be rubbed into the skin. It can be applied every half hour if necessary. If no medicine is available cold compresses will give relief to badly burned areas.

BURNS AND SCALDS.

Description.—Burns are produced by dry heat, such as a flame or a hot iron, while scalds are due to moist heat as, for example, steam or hot water. The gravity of a burn depends upon its situation, the amount of surface involved, and the depth of tissue injured. The

burning of a large area, even though slight, is more dangerous than a small deep burn. Burns of the head, chest, or abdomen are more serious than those of the limbs. Burns involving more than one-half of the surface of the body almost always end fatally. In severe or extensive burns there is almost always shock, which requires special treatment before the burns are dressed (p. 220).

When the clothing is on fire, the best way to extinguish it is to wrap the person in a blanket, overcoat, mackintosh, or a rug or piece of carpet, and smother out the flames. If the person is alone, he should wrap himself up in a similar way or roll on the floor. The method of carrying an unconscious person from a burning building is described on page 304.

Treatment.—Of slight or small burns or scalds.

As soon as the injury is received plunge the part in cold water, preferably ice water. This checks the action of the heat and instantly stops the pain. If boiling water or soup is spilled over the leg or foot. do not wait to remove the clothing but thrust the entire part into a bucket of water or pour cold water freely over it. Keep submerged in cold water, or covered with a cold-water dressing, which is frequently renewed for 20 minutes to a half hour, depending upon the severity of the injury. Then apply a permanent dressing. There are many ways of treating burns, all of which have their advocates.

A very satisfactory dressing is plain vaseline or petroleum molle. This is spread with a knife on clean pieces of old muslin, gauze, or similar material, just as butter is spread on bread. The prepared cloth is then cut into strips and the strips laid on the burns "buttered" side down. The plan of using several or more small strips is better than applying one large piece, as the smaller dressings come off much more easily when the burn is re-dressed. A thin layer of cotton may be applied over the muslin or gauze to protect the part from injury and the entire dressing held in place by a suitable bandage. *Never, under any circumstances, apply cotton directly to a burn.* A good deal of fluid exudes from a burn, and this fluid will harden in the cotton and cement it firmly to the surface of the wound so that it can not be removed without great pain and interference with the healing process.

Blisters may be opened by a needle, the point of which has been passed through a flame. The dressings should be removed at the end of 24 hours and fresh ones applied. Every household should keep on hand a large jar of vaseline for the purpose of dressing burns. Boric-acid ointment makes a most excellent dressing for injuries of this sort. A substitute is made by thoroughly mixing 1 part of boric acid with 10 parts of petroleum molle or vaseline. In the absence of vaseline use sweet oil, olive oil, castor oil, or some of the many prep-

FIG. 312.—Spreading muslin with vaseline as a dressing for burns.

FIG. 313.—Cutting spread cloth into strips.

FIG. 314.—Applying strips to burn.

FIG. 315.—Schaefer method of artificial respiration, step one. Throwing weight on patient's back to force air out of the lungs.

FIG. 316.—Schaefer method of artificial respiration, step two. Removing weight from hands on patient's back so that air may enter lungs.

FIG. 319.—Method of getting water out of the lungs of drowned person.

arations of liquid petrolatum now so extensively advertised for the cure of constipation. In emergencies automobile grease or cylinder oil may be used, but always put the medicine on the dressing and then lay that on the wound rather than to attempt to spread the medicine on the surface of the burn itself. Carbolized vaseline should never be used on a burn, as the carbolic acid, if of any considerable strength, is apt to cause extensive sloughing of the part and deep ulcers, which are extremely difficult to heal. The picric-acid treatment for burns has been highly recommended and is much used, but its use should be restricted to limited burns of a rather mild degree. Some first-aid kits contain picric-acid gauze, which is first wet and then applied as a compress. Carron oil was formerly much used and is composed of equal parts of linseed oil and limewater. It is not as good as vaseline or pertoleum molle and has the objection of soaking through the dressings and soiling the bed or clothing.

SEVERE EXTENSIVE BURNS.

First-aid treatment.—These require the attention of a physician if available. Such injuries are always accompanied by shock (p. 220), and they should be treated by absolute quiet, covering the patient with blankets or warm clothing, applying hot-water bags and the administration of stimulants such as hot strong black coffee, half a teaspoonful of aromatic spirits of ammonia in a little water, or one large drink of whisky. It may be necessary to give one-fourth grain of morphine sulphate or some preparation of opium to allay the pain. Do not place horse blankets next to the skin on account of the danger of lockjaw.

After treatment.—When the patient has reacted from shock, the clothing should be removed carefully, cutting it around the places where it sticks to the flesh. If patches of hot tar or some sticky substances are adherent to the skin, do not try to remove them, but place the dressing over the foreign substances. They will gradually loosen up and come off. Cover the burned areas with strips of gauze or clean muslin spread with vaseline, boric-acid ointment, or petroleum molle, as described for slight burns. Place a layer of cotton over the gauze and keep the dressing in place with a suitable bandage. The dressing is removed once a day and the burned surface irrigated with a tepid solution of boric acid made by adding a heaping tablespoonful of the boric acid to a pint of hot water. Salt solution in the proportion of a teaspoonful of salt to a quart of boiled water may also be used. After the surface has been thoroughly irrigated, apply a fresh dressing as before. Great care should be exercised in handling such cases, and the dressings removed with great gentleness,

for the pain and shock caused by this procedure, if roughly done, may materially affect the patient's chances for recovery.

In extensive burns the complete submergence of the part in a warm solution composed of 1 teaspoonful of salt to a quart of water will give good results. In the case of children who have very extensive burns it is sometimes practicable to place them in a bathtub partially filled with the above solution, supporting them on rubber air pillows and covering them with blankets. All parts may be kept completely submerged in this fashion, except the head, for several days, hence the continuous attendance of a nurse, both day and night, is required to see that the bath is kept at the proper temperature and that the child does not drown. In burns of the fingers and toes it is necessary to keep dressings between the burnt members during the healing process, or otherwise the fingers or toes may grow together. After all extensive burns tough scars will form, which gradually contract, and extensive permanent deformities may result. A person who has been extensively burned should receive a light but nutritious diet, preferably of soup, milk, and eggs. The bowels should be kept open and care should be taken to empty the bladder with a catheter in case the urine is not voluntarily passed.

Mixtures of paraffin with other oils and substances have been recently much advocated for the treatment of burns, especially abroad. The preparation, which is solid when cool, is melted and sprayed on the burned surface with an atomizer or it may be applied with a soft brush. Then a layer of cotton batting is applied to the burn and more of the warm paraffin mixture sprayed over it. The protective dressing is removed once a day, the surface irrigated with some weak antiseptic solution, dried with compresses of gauze, and another application put on. A preliminary coat of liquid petrolatum diminishes the pain of spraying the hot solution onto the injured surface. This method of treatment has not been as highly indorsed in this country as in Europe, and the technique and the apparatus required for dressing burns in this way is probably too complicated for the use of the layman.

BURNS FROM CHEMICALS SUCH AS STRONG ACIDS OR ALKALIES.

These substances, when coming in contact with the skin, frequently cause burns similar in many respects to those produced by heat. The chemical should be immediately washed off as quickly as possible with a stream of running water. It is rarely advisable to attempt to counteract the substance with some other chemical, as the proper materials for this purpose are not often at hand, and if

freely flowing water is used the same effect can be produced in this manner. After prolonged washing dress the burn in any of the methods as described above.

BURNS FROM CARBOLIC ACID.

The skin is frequently injured by accidental contact with carbolic acid. This substance is more easily removed by some form of alcohol than in any other way. Pure alcohol is best, but if it can not be obtained, whisky, brandy, or any other beverage containing alcohol should be freely and continuously poured over the part. Do not, however, use wood alcohol. While waiting to obtain a preparation containing alcohol, cold water will be of assistance in getting rid of the carbolic acid.

BURNS OF THE EYE BY CHEMICALS.

Frequently various caustic substances get into the eye, especially lime in making mortar. The treatment is to wash the eye freely with cold water. In order to do this the patient should be laid on the ground, the eyelids held open by the fingers, and the water poured into the eye from a pitcher, can, or other container. Use plenty of water and wash thoroughly, being sure that it actually gets into the eye. After the chemical is removed a few drops of a saturated solution of boric acid should be put into the eye. In the absence of boric acid a few drops of sweet oil or olive oil may be used.

ELECTRIC BURNS.

When a person comes in contact with a live electric wire, severe and deep burns are frequently produced.

Treatment.—Electric burns should be dressed for several days with wet dressings of boric acid solution (p. 187), afterwards with dry gauze lightly spread with vaseline. Such burns are always very slow in healing.

SUNSTROKE AND HEAT EXHAUSTION.

(For the symptoms and treatment of sunstroke and heat exhaustion see p. 160.)

EFFECTS OF COLD.

By Assistant Surgeon General W. G. STIMPSON.

FROSTBITE.

Symptoms.—The local effects of cold are, according to their severity, usually divided into three degrees. In the first degree the part is painful and the skin is of a dark red hue. This condition is known as chilblain, and occurs chiefly when children or poorly nourished persons are exposed to cold. In frostbites of the second degree the skin is of a bright red or livid hue and blisters form on its surface. In the third degree the part is pale, stiff, and brittle. Severe cold causes constriction of the blood vessels, and if the blood is completely cut off for a considerable time death of the tissue results.

If heat is applied to a part that has been slightly frostbitten a sensation of itching and tingling is experienced. In frostbites of the second degree heat causes pain and swelling. The skin may peel off, leaving a raw surface. In the third degree, if the part is dead no reaction takes place. The dead portion turns black, and a line of separation takes place between it and the living tissue. If heat is suddenly applied to a badly frozen part of the body the liability to gangrene (death of the tissue) is increased on account of the intense reaction that takes place in the tissue that is still living.

When the whole body is exposed to severe cold the individual becomes benumbed, exertion is difficult, and drowsiness which can not be resisted overtakes him. The eyesight fails, he totters as he walks, and then falls and becomes unconscious.

Prevention.—All parts of the body should be kept as dry as possible, as dampness increases the tendency to frostbite. The shoes should be large, and puttees or leggings should be worn loose in order not to impede the circulation of the blood. Tight garters must not be worn. It is well to wear two pairs of stockings, a woolen pair over a cotton pair. The ears and the face, except the eyes, nose, and mouth, should be well covered, especially if snow is falling or a brisk wind is blowing. Fur-lined gloves are warmer than woolen ones. Special care should be taken of the feet; they should be washed each day and a small quantity of oil should be rubbed into them. A large amount of oil does harm; only enough should be used as can be well rubbed in, leaving a dry surface when the rubbing is completed. Clean stockings should be put on each day. Wet stock-

ings should be changed for dry ones. If a person has to be on duty with wet feet an opportunity should be afforded him to put on dry stockings at least every six hours. The feet are less likely to become frostbitten if a person keeps moving. If he has to stand in one place shoestrings and puttees should be loosened.

Treatment.—If a physician is present, his instructions should be followed. If the frostbite is of the first degree—that is, if the tissue is only slightly frostbitten—the part should be gently rubbed, and cloths wrung out of cold water should be applied. Snow may be rubbed on the part, but it is not as efficient as cold cloths. The rubbing and the applications should alternate, rubbing a few minutes, and then applying cloths for a few minutes. The temperature of the water in which the cloths are soaked should be gradually raised until it is lukewarm. In frostbites of the second degree—that is, where the skin is of a livid hue and blisters have formed—no rubbing should be practiced, as there is danger of increasing the damage. Cold cloths should be applied, but the cold must not be kept up too long, as cold prolongs the cause of the injury. The temperature of the water should be gradually raised a degree or two every few minutes, using fresh cloths each time the temperature of the water is changed. It should be remembered that reaction takes place naturally as soon as the person is brought into the house out of the cold, even if he is treated in a cold room, and the object of treatment is to prevent this reaction from taking place too rapidly and at the same time not unduly retard the restoration of vitality. In frostbites of the third degree the same method should be followed to bring about a reaction as in those of the second degree; reaction, however, will not happen in a part that is dead, but the adjacent living tissue will react, and a red line will form between it and the dead portion.

In some cases reaction has already taken place when the person is first seen. In these cases the above treatment is unnecessary. After reaction has occurred the patient should be moved into a warm room, and an ointment composed of vaseline 1 ounce, camphor 6 grains, should be applied. The part should then be surrounded with absorbent cotton or wrapped in flannel cloths. Boracic acid ointment may be used instead of the vaseline and camphor. Blisters that form should be pricked with a needle and the water allowed to flow out, but the covering of the blisters should not be disturbed. If gangrene occurs, cloths wet with alcohol placed over the part prevent infection and hasten the separation of the dead part from the living tissue.

A person who has been exposed to a low temperature or submerged in cold water should be placed in a cold room, and artificial respiration should be performed. The extremities should be rubbed with

a solution composed of equal parts of alcohol and water. When the patient begins to react the temperature of the room should be slowly raised, and the patient should be given hot drinks, coffee, tea, or chocolate. If the patient is unable to swallow, a pint of hot coffee or tea should be injected into the rectum. Efforts to restore animation should be continued for an hour or two, as persons have been brought to life after being apparently dead.

SUFFOCATION.

It is necessary that fresh air should be constantly entering the lungs and used air expelled if life is to be maintained. When this process is stopped or markedly obstructed suffocation results.

Most cases of suffocation are treated by removing the direct cause and performing artificial respiration. To do this properly the operator should have some knowledge of the respiratory system.

Respiration.—All parts of the body require oxygen which is carried to them by the circulating blood. The blood gets its oxygen while passing through the lungs from the inspired air. The tissues also form a harmful gas called carbon dioxide, which is collected by the blood and given off in the lungs and then expelled in the breath. Breathing, or respiration, consists of inspiration and expiration. Inspiration is the act of drawing fresh air into the lungs, and expiration is the process of forcing the used air out. The normal adult breathes at the rate of 18 times a minute.

Respiratory system.—The nose, mouth, windpipe, and lungs constitute the respiratory or breathing apparatus. The lungs are two large spongy organs or sacs in which the blood is brought into close contact with the air so that oxygen may be absorbed and impurities given off. The lungs lie closely against the chest walls and rest below on a thin partition of muscle extending across the body called the *diaphragm.* The diaphragm separates the main cavity of the trunk into compartments. The upper space contains the heart and lungs, the lower the stomach, intestines, and other internal organs. The chest walls are somewhat movable, and when they are pressed together a part of the air is forced from the lungs. When they are allowed to spring up again the size of the cavity increases and fresh air is drawn in. Respiration in a normal person is carried on chiefly by the contraction of the diaphragm, assisted by the movements of the chest walls. In artificial respiration the entrance and exit of the air is produced by alternately forcing the chest walls nearer together by pressure on the chest or back and then releasing them so that they may spring back to their original shape.

Method of performing artificial respiration.—There are two methods of artificial respiration in common use, but only the Schaefer, or

the prone-pressure method, will be described, because it is believed to be the more efficient, and it is certainly easier to perform.

Before starting artificial respiration always remove the cause of suffocation. This may be water in the lungs, or an obstruction in or around the throat, or contact with an electric current. In the case of persons overcome by gas, remove to fresh air.

The Schaefer method.—The collar is removed and shirt band loosened. The patient is laid on the ground, face downward. The arms may be raised about the head, one arm flexed so that the forehead rests upon it. The face must be turned slightly to one side, so that the nose and mouth will not be closed by pressure against the ground. The operator stands or kneels astride of the patient and places his hands close together, one on each side of the backbone at about the region of the short ribs—that is, about the middle of the body. The operator now leans forward (fig. 315) and throws his weight on his hands, which are against the back, thus pressing the lower part of the chest against the ground and also to a certain extent forcing the belly contents up against the diaphragm. The effect of this double procedure is to decidedly diminish the capacity of the chest and air is forced out. The pressure is applied firmly but gently, and then removed by the operator bending his body backward and taking the weight off his hands (fig. 316). The removal of pressure causes the chest to expand and the organs of the abdomen to recede by their own elasticity, and this expansion of the chest cavity draws air into the lungs through the windpipe. The operator pauses for about three seconds to allow the fresh air to become mixed with the blood and then repeats the process. These alternate procedures of compressing the chest and then relieving it and pausing for three seconds are continued rhythmically until the patient begins to breathe himself. The movements are performed at the rate of about 12 to 14 times per minute. It takes about a second before the air is all out and a second for it to enter, and the three seconds' pause makes it a total of five seconds for the complete cycle. The hands should remain in the proper position upon the back after the pressure has been removed, but no weight should be placed upon them. The operator swings his body backward and forward with the least possible exertion, and on this account is able to keep up the movements for a long time without undue fatigue. It may be necessary to perform artificial respiration for several hours, or even longer. In rare instances it has been kept up more or less continually for several days. In any event, it should be tried for at least an hour and a half. A good rule is that artificial respiration in suffocation cases should be performed until it is certain that the individual is dead, and then continued for an hour and a half longer. Many persons who were apparently lifeless have been finally restored by long-continued efforts.

When the air enters and leaves the chest it makes a very audible sound in passing through the paralyzed throat. If this sound is not heard it may be inferred that the method is not being properly applied.

When the patient begins to breathe voluntarily in a regular manner, he should be turned on his back and suitable measures toward keeping him warm applied. Later on when he is conscious and can swallow, stimulants are administered such as hot black coffee or aromatic spirits of ammonia. The limbs should be vigorously rubbed toward the heart to assist in restoring the circulation and bringing up the body warmth. If vomiting occurs, turn the head to one side so that the vomited matter will run out of the mouth and not get back into the lungs. When breathing is fully established and the general condition good, the patient should be put in bed warmly covered and if he is cold external heat applied. Care should be taken to see that he has plenty of fresh air.

Various mechanical devices, such as pumps or bellows, connected with face masks or similar appliances, have been devised for the purpose of performing artificial respiration. Many of these machines have been widely advertised and highly recommended. A more extended trial, however, has demonstrated that some of them are not entirely satisfactory and their use is occasionally followed by undesirable complications. Further developments along these lines may succeed in producing an apparatus, however, which will be free from any defects.

After natural breathing begins the patient must be carefully watched because it may fail and artificial respiration be again necessary.

In all cases of suffocation send for a doctor, if available, but do not wait for his arrival before starting artificial respiration. This should be commenced immediately as a few moments' delay may mean the loss of a life. The method of performing artificial respiration is the same in all cases of suffocation.

Causes of suffocation.—These are submergence of the body in water, the breathing of certain gases, a foreign object in the throat, strangulation, and sometimes swelling of the upper air passages.

Symptoms of suffocation.—When a person for any reason is not getting sufficient fresh air the face becomes blue or almost black, the veins stand out and he fights frantically for breath. If relief is not obtained, the efforts to secure air become more violent and the duskiness of the face increases. Convulsions may occur but finally unconsciousness sets in to be followed shortly by death. A person who has been apparently dead from suffocation for several minutes or longer may frequently be revived if the cause is quickly removed and artificial respiration immediately started.

DROWNING.

Prevention.—Ordinary care and caution will do much to prevent accidents in the water. Inexperienced persons should not attempt to handle sailboats or even rowboats. Pleasure craft should not be overloaded nor attempts be made to change seats in small boats except with great caution.

The swimmer should be careful not to overtax his strength, not to remain in the water too long, or to get so far out that he might be caught by the undertow. Every child should be taught to swim, and all parents should appreciate the necessity of their children being given this training.

RESCUE OF DROWNING PERSONS.—If possible, do not attempt to rescue a drowning person in deep water by entering the water yourself. The best interests of the drowning person are served, when practical, by holding out or throwing something into the water on which he can support himself till he can be pulled ashore or reached in a boat. In case a person has fallen into deep water near the shore take an oar, a pole, a rope, or even your coat and hold it out so the drowning person may grasp it. Life preservers, boxes, boards, or logs may also be thrown into the water close to the person drowning. As has been stated above, a small, floating object is quite sufficient to sustain a person's weight in the water.—*American Red Cross Abridged Text-Book on First Aid.*

INSTRUCTIONS FOR SAVING DROWNING PERSONS BY SWIMMING TO THEIR RELIEF.

(From the Handbook For the Ship's Medicine Chest.)

1. When you approach a person drowning in the water, assure him, with a loud and firm voice, that he is safe.

2. Before jumping in to save him, divest yourself as far and as quickly as possible of all clothes; tear them off, if necessary; but if there is not time, loose at all events the foot of your drawers, if they are tied, as, if you do not do so, they fill with water and drag you.

3. On swimming to a person in the sea, if he be struggling, do not seize him then, but keep off for a few seconds till he gets quiet, for it is sheer madness to take hold of a man when he is struggling in the water; and if you do, you run a great risk.

4. Then get close to him and take fast hold of the hair of his head, turn him as quickly as possible onto his back, give him a sudden pull, and this will cause him to float, then throw yourself on your back also and swim for the shore, having hold of his hair, you on your back and he also on his, and, of course, his back to your stomach. In this way you will get sooner and safer ashore than by any other means, and you can easily thus swim with two or three persons. One great advantage of this method is that it enables you to keep your head up, and also to hold the person's head up you are trying to save. It is of primary importance that you take fast hold of the hair and throw both the person and yourself on your backs. After many experiments, it is usually found preferable to all other methods. You can in this manner float nearly as long as you please, or until a boat or other help can be obtained.

5. It is believed there is no such thing as a death grasp; at least it is very unusual to witness it. As soon as a drowning man begins to get feeble and to

lose his recollection, he gradually slackens his hold until he quits it altogether. No apprehension need, therefore, be felt on that head when attempting to rescue a drowning person.

6. After a person has sunk to the bottom, if the water be smooth, the exact position where the body lies may be known by the air bubbles, which will occasionally rise to the surface, allowance being, of course, made for the motion of the water, if in a tideway or stream which will have carried the

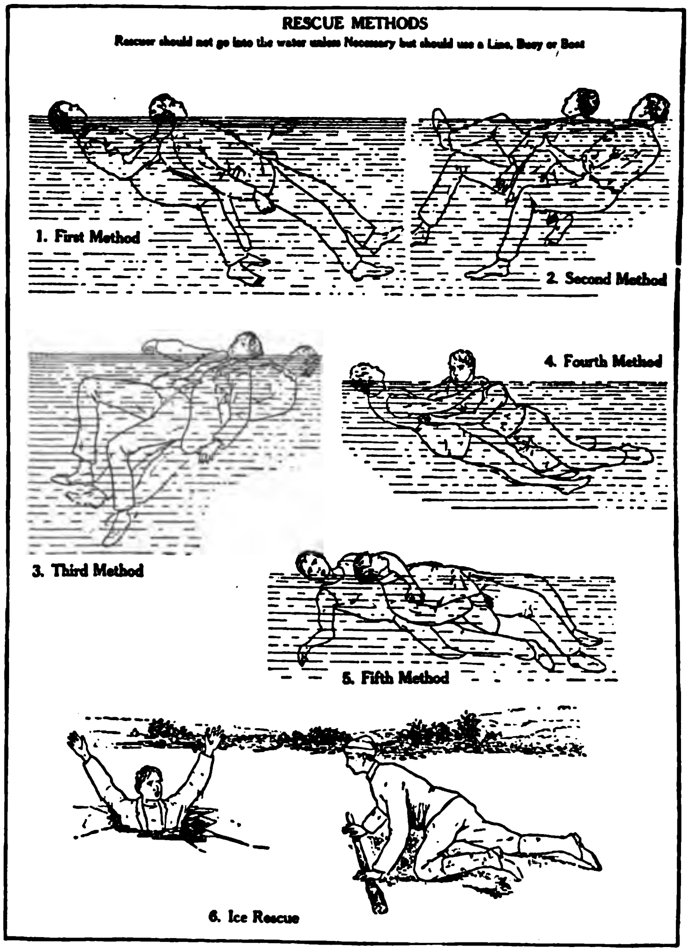


FIG. 317.—Saving drowning persons. (Courtesy American Red Cross.)

bubbles out of a perpendicular course in rising to the surface. Oftentimes a body may be regained from the bottom before too late for recovery by diving for it in the direction indicated by these bubbles.

7. On rescuing a person by diving to the bottom the hair of the head should be seized by one hand only and the other used in conjunction with the feet in raising yourself and the drowning person to the surface.

8. If in the sea, it may sometimes be a great error to try to get to land. If there be a strong "outsetting" tide, and you are swimming either by yourself

or having hold of a person who can not swim, then get on your back and float till help comes. Many a man exhausts himself by stemming the billows for the shore on a back-going tide and sinks in the effort, when if he had floated, a boat or other aid might have been obtained.

9. These instructions apply alike to all circumstances, whether as regards the roughest sea or smooth water.

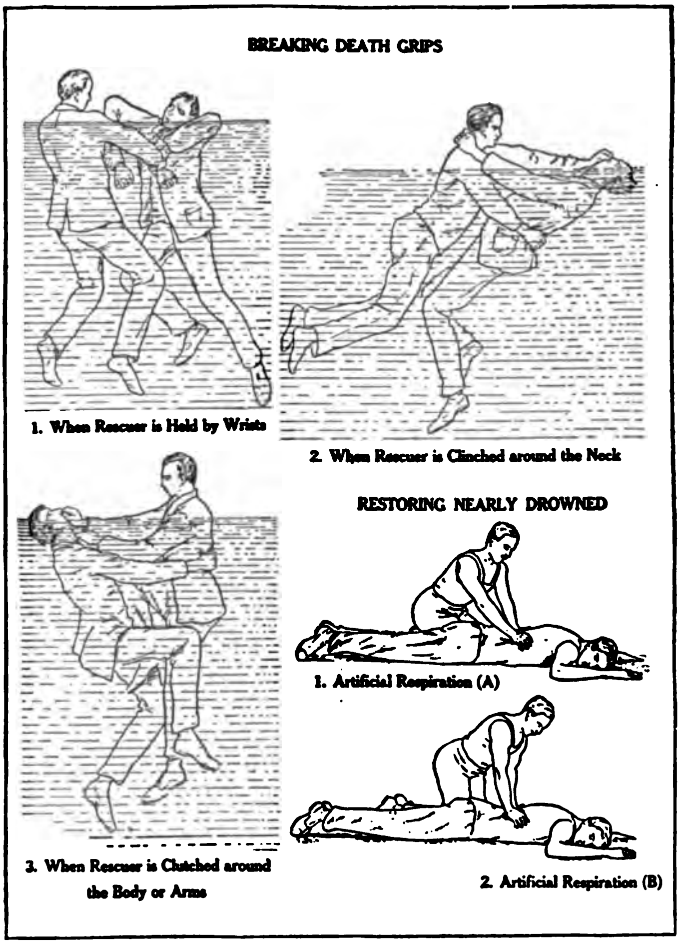


FIG. 318.—Saving drowning persons. (Courtesy American Red Cross.)

The popular idea that a drowning person rises to the surface three times is apparently incorrect. Some persons never come to the surface at all. Others come up but once, so no assumption should be made that the rule of coming up three times will always hold true.

When a person has been brought to land or other safe place, if he is unconscious, the first procedure is to get the water out of the lungs. To do this roll him on his face, stand astride of the hips, and clasp the hands under the lower part of the abdomen. Lift up the

hips and abdomen by straightening the back. This will cause the head to be lower than the lungs and the water will run out of the mouth (fig. 319). Hold in this position for a few moments, or as long as the water runs out of the mouth, giving the body several slight shakes. Then sweep the finger into the mouth to see that the throat is not clogged with sand, seaweed, or other matter, remove tight clothing from around the neck or throat and begin artificial respiration immediately. It is not necessary to roll an apparently drowned person over a barrel to get the water out of him. Attempts at resuscitation on a beach should not be made with the part of the body submerged in the water or in such a position that a wave may sweep over the unconscious person. It is better to drag him well up where he will be dry and out of danger.

Artificial respiration on apparently drowning persons should be carried out as directed on page 277. As soon as the person is revived and the breathing is satisfactory, he should be taken to some warm place, the extremities rubbed, and suitable general remedies administered.

ELECTRIC SHOCK.

Many of the wires strung about city streets carry powerful electric currents. If such wires become broken or sag down, passers-by may come in contact with them and receive severe and possibly death-dealing shocks.

Prevention.—Broken wires of any sort dangling from their poles should not be touched. They may carry dangerous currents themselves or be temporarily charged, because they are somewhere resting on live wires.

Symptoms.—In severe electric shock there is sudden loss of consciousness, the breathing is apt to be entirely arrested, and the pulse weak. Burns may be caused by the arcing of the current where the wire has touched the body.

Treatment.—The first thing to be done is to break the contact of the person with the wire or third rail; great care must be exercised in doing this or the helper may be as badly injured as the original victim. The body of a person lying upon a conductor is fully charged with the electricity, and it is dangerous to touch it with bare hands unless the body of the assistant is thoroughly insulated. The coat, however, may be grasped, and possibly the injured person can be dragged from the wire in this manner without actually touching the flesh. If absolutely necessary to take hold of the body, wrap the hands in several thicknesses of dry cloth, rubber sheeting, or dry newspapers, and stand on a dry board or other nonconductor if possible.

A live wire may be removed from an unconscious person by lifting it off with a dry pole, wooden walking stick, or some similar article

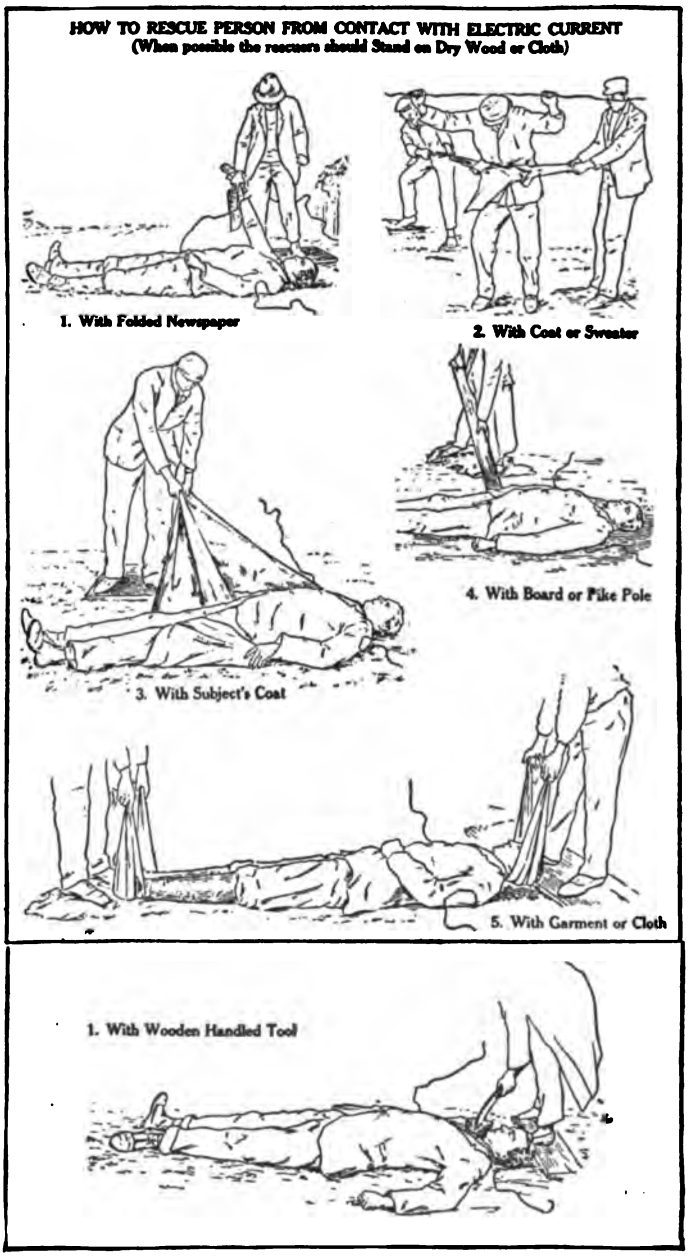


FIG. 320.—Electric shock. (Courtesy American Red Cross.)

made of wood, which is a nonconductor. The wood must be dry, however. The person endeavoring to perform the rescue should in

all cases stand on a dry board if it is obtainable. A number of newspapers, or the operator's folded coat will answer the same purpose in an emergency. Rubber overshoes and heavy rubber gloves furnish good protection. If the powerhouse is near or there is a switch in the locality, it may be better to attempt to have the current turned off rather than to try other procedures. If the live wire is so twisted around the body that it is necessary to cut it, use an ax or hatchet with a wooden handle. Be careful that the cut end does not strike the operator.

When a wire is taken off the body or a person removed from the wire, this should be done with one motion if possible, because if the wire touches the person several times burns will be received at each contact.

After the person has been removed from the current, if he is not breathing, artificial respiration should be immediately performed followed by the usual restorative measures as described on page 277. For the treatment of burns from electric wires, see page 273.

GAS POISONING.

Gas poisoning is a frequent accident, especially in the larger cities and towns where gas is used for illumination purposes. Various gases may be detrimental when inhaled for a considerable period, the amount of injury depending upon the nature of the substance, and even apparently innocuous gases, such as carbon dioxide, may cause death, not by their direct action but by depriving the patient of air because they have replaced it, and the patient is not getting oxygen. Gases like ammonia or chlorine may quickly produce death from shock and irritation. Recently deaths have been reported from the gas generated by an automobile engine running in a small garage which was tightly closed on a cold morning. The use of poisonous and irritating gases in warfare has been developed to a great degree in the present European war.

Firemen are frequently overcome from the effects of smoke and the products of combustion from wood, varnish, and other materials in burning buildings.

By far the greater number of cases of suffocation due to gas in this country are caused by illuminating gas. Many persons use this method of committing suicide.

Prevention.—A gas burner should never be turned down low and allowed to burn all night in a room in which persons are sleeping, as the flame may be extinguished by a change in pressure or a slight draft and later the room become filled with gas. When going into burning buildings which are filled with smoke it is well to tie a cloth wet with water around the nose and mouth. As the air is generally purer near the floor than at the ceiling, the person should

if necessary, walk on the hands and knees or crawl on the floor. In entering a room or other place which is full of gas to remove a suffocated person take several deep breaths of pure air outside and spend as brief a time in the compartment as possible.

Symptoms of illuminating-gas suffocation.—Preliminary signs are headache, dizziness, nausea, feeling of sleepiness and langour, and a rapid pulse. In later stages when unconsciousness comes on, the face and hands are blue, heart action is very rapid and weak, and breathing may be shallow or entirely suspended.

Treatment.—The patient should always be immediately removed to where the air is fresh and good. If he is only slightly affected, walk him up and down in the open air and give some effervescing drink, such as soda water, Weiss beer, or a teaspoonful of baking soda in a glass of water. This will cause belching of the gas and relief from nausea.

In more severe cases, when the patient is more or less unconscious but still breathing, sprinkle a few drops of ammonia water on a handkerchief and allow the patient to take one breath with this under his nose, once a minute. Rub the arms and legs briskly toward the heart to promote the circulation. If the patient is conscious enough to swallow, give one-half teaspoonful of aromatic spirits of ammonia in half a glass of water.

If breathing has ceased, begin artificial respiration at once, after loosening the collar or any tight clothing around the neck and chest. Have an assistant give whiffs of ammonia, as described above, and also rub the extremities toward the heart; but do not let these procedures interfere with the artificial respiration, which must be continued without interruption until the patient begins to breathe of his own accord in a regular manner.

The after treatment is rest in bed with appropriate stimulation. In severe cases the patient should be kept in bed until he has fully recovered, as dangerous symptoms have followed getting up too early.

STRANGULATION AND HANGING.

Treatment.—Remove the cause immediately. In cutting down a person who has attempted to commit suicide by hanging, hold the body in such a way that he will not be injured by the fall. Remove the noose and then immediately proceed to perform artificial respiration. The after treatment is the same as for other cases of suffocation.

UNCONSCIOUSNESS.

Description.—A person is unconscious when he does not realize what is going on around him. Unconsciousness may be complete or partial. In the latter case the individual can be aroused, but is not fully in the possession of his senses.

Causes of unconsciousness.—All forms of unconsciousness are due to a disturbance of the brain of some sort. The causes which act on the brain and produce this condition are many and varied. A blow on the head or pressure on the brain from a large blood clot or a depressed fracture of the skull may cause unconsciousness. A lack of blood supply to the brain produces the same condition as in fainting. Certain drugs, like opium, ether, chloroform, or large amounts of alcohol when circulating in the blood affect the brain and are followed by loss of consciousness. Such substances may be absorbed from the stomach or inhaled and taken up by the lungs. The system itself may produce poisons which are not gotten rid of and unconconsciousness follows. This frequently occurs before death from diabetes. Finally, unconsciousness may be a symptom indicating a disease of the nervous system, such as epilepsy.

An unconscious person is absolutely helpless and especially dependent on his friends or whoever happens to be near for aid and protection from harm. However, a word of warning concerning the handling of unknown unconscious individuals in public places may not be amiss. It is not wise to follow a perfectly natural impulse to search the clothing or to look through the pocketbook of an unconscious person to ascertain his name and address. Such an act may be interpreted by the bystanders as an attempt at robbery, and unpleasant complications result. These measures should be left to the police or other persons of recognized authority.

GENERAL RULES FOR THE EXAMINATION OF UNCONSCIOUS PERSONS.

1. Feel the pulse at the wrist and form an estimate of its rate and force. A rapid, weak pulse indicates a dangerous condition. A strong pulse, beating between 76 and 90, is a good sign.

2. Determine whether the person is breathing or not and the nature of the respirations; whether they are slow or fast, deep or shallow.

3. Note the color of the face.

4. Observe if the skin is hot or cold and the presence or absence of perspiration.

5. Examine the eyes to see if the pupils or black spots in the middle of the eye are small or large (figs. 322 and 323). Compare the two eyes to see if the pupils are of the same size (fig. 324).

6. If the person has evidently been the victim of an accident, look for hemorrhage and feel the head to detect possible fractures of the skull.

7. Take into consideration the surroundings and other general conditions. When the heat is excessive, heat strokes are a common cause of unconsciousness. An empty bottle near by may suggest attempted suicide by poisoning. Signs of a struggle might indicate an assault with brain injury.

FIG. 321.—Normal pupils.

FIG. 322.—Dilated pupils.

FIG. 323.—Contracted pupils.

FIG. 324.—Unequal pupils. A common symptom of apoplexy or brain injury.

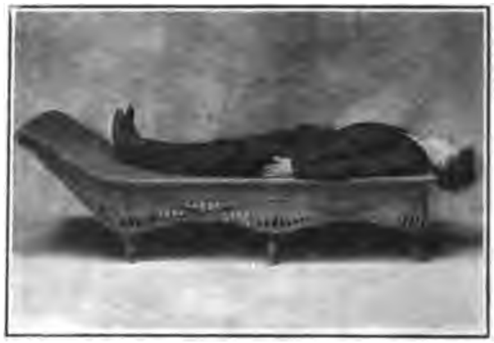


FIG. 325.—Head low in fainting.

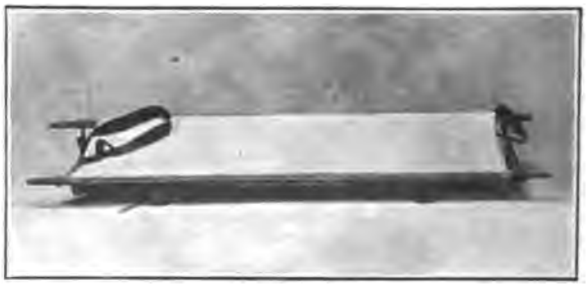


FIG. 326.—Regular stretcher.

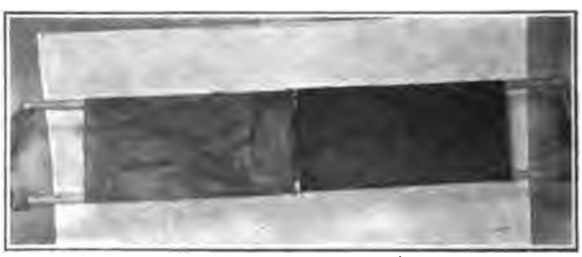


FIG. 327.—Improvised stretcher made of bags.

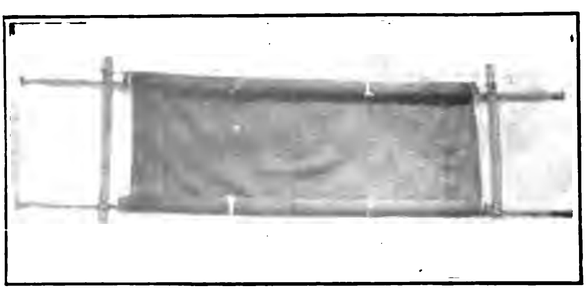


FIG. 328.—Blanket stretcher.

FAINTING.

Fainting is a temporary loss of consciousness due to insufficient supply of blood to the brain.

Some persons faint very much more easily than others. The tendency toward fainting does not always depend upon the physical strength, and strong men sometimes faint from very slight causes.

Persons may faint from exhaustion, weakness, hemorrhage, extreme heat, lack of air, or some emotional shock, such as fear or the sight of blood. There is a very important mental element in almost all fainting attacks.

Symptoms.—A feeling of weakness comes over the patient and black spots float before the eyes. The face becomes pale or greenish yellow, and the lips lose their natural color. Cold perspiration breaks out on the forehead. There is a tendency to yawn; the pulse is rapid and weak and the respirations are very shallow. Finally, the patient sinks back in his seat or falls to the ground unconscious.

Treatment.—When the beginning of the attack is felt or noticed, it may be possible to check it by lowering the head between the knees. If in spite of this the symptoms continue, immediately place the patient in a recumbent position and lower the head. When a couch or bench is available, lay the person on it with the head hanging over the end or side. The color of the face is a good indicator of the blood supply of the brain. A pale face indicates a lack of blood in the brain. Lowering the head causes the blood to go to the brain by gravity. As a general rule in all accidents, if the face is pale, lower the head. If the face is red, raise the head on a pillow or coat.

It is important that the fainting person should have plenty of fresh, cool air. This alone will often bring about recovery. Dashing cold water on the face or chest is useful. Smelling salts or a few drops of ammonia water on a handkerchief held under the nose at intervals of a minute apart, until the patient has taken one breath, and fanning the face, will assist in recovery, but ordinarily all that is required is a recumbent position with the head low. When the patient becomes conscious give one-half a teaspoonful of aromatic spirits of ammonia in water if available. Do not permit the person to get up or to attempt to walk until he or she is fully recovered.

ACUTE ALCOHOLISM.

The taking of large quantities of alcohol in the form of whisky, brandy, or other liquor will produce unconsciousness. The symptoms of drunkenness are familiar to most persons, but there are certain characteristic features which should be carefully studied in order to distinguish alcoholic coma from other very serious conditions with which it may be confounded. A drunken man may be severely in-

jured, may have taken poison, or have a stroke of apoplexy. In fact, his condition makes such accidents more likely to occur.

Symptoms of acute alcoholism.—The first effects of alcohol are a peculiar feeling of well-being and exhilaration. The individual becomes talkative, self-assertive, and boastful. As the amount is increased the speech becomes indistinct, the eyelids heavy and the gait uncertain. Later sleepiness, stupor, and general loss of control of the muscles develop. Finally, the patient becomes partially or completely unconscious.

When a drunken man is examined it will be found that the pulse is somewhat rapid but usually strong. The breathing is deep and slow. There is often snoring. The face may be red or pale, the skin cool. The pupils are equal (fig. 321) and there is an odor of alcohol on the breath. The individual can be generally aroused to a certain extent by shouting in the ear or pounding on the soles of the feet.

Too much reliance must not be placed on the smell of alcohol on the breath. As before stated a drunken man may meet with an accident, or an injured person may smell strongly of the liquor which has been administered by some sympathetic bystander. The indiscriminate giving of whisky to persons who have met with accidents can not be too strongly condemned. Unfortunately there appears to be an ill-founded popular idea that the proper procedure is to give a drink to every injured man. Large doses of alcohol frequently confuse the symptoms and later add to the general depression of the patient. In head injuries or in apoplexy, any form of stimulation is absolutely contraindicated.

Treatment of acute alcoholism.—When a man has taken too much liquor the proper thing to do is to remove as much of it from the system as possible. If the patient is conscious the stomach should be emptied by an emetic or tickling the throat with the finger. As an emetic, use a teaspoonful of mustard or a teaspoonful of salt in lukewarm water. Repeat several times if vomiting is not produced. Afterwards when he arouses from his stupor, give strong, black coffee and copious draughts of cold water.

Sometimes drunken men are found on the street or in other places and it is necessary to arouse them in order to get them home or to a place of safety. This can be done by any severe shock such as dashing cold water on the face, slapping the face, or making pressure on the facial nerve with the forefingers under the ears just behind the jaws, pressing upward and inward.

FITS.

Fits are a symptom of a disease called epilepsy in which the patient goes into a more or less violent convulsion with gnashing of the teeth and frothing at the mouth and then falls unconscious. These attacks

may occur at rare intervals or as frequently as several times a day. The attacks differ greatly in their severity as well as their frequency. The period of unconsciousness may be only momentary or may continue for several hours. The patient is apt to bite his tongue during the convulsion or to fall and injure himself by striking some hard object.

Treatment of the convulsion.—Do not attempt to prevent the movements or to break the grip as the fit can not be checked in this way. Lower the patient to the ground or floor and simply protect him from harm by gentle restraint and guard against biting the tongue by inserting a piece of wood or a wad of paper between the teeth and holding it in place.

No effort should be made to arouse the person from the period of unconsciousness which follows, but he should be warmly covered and placed in a safe place and allowed to sleep until he awakens naturally.

In examining unconscious persons in which a fit is suspected always look at the tongue and also the forehead and face. If the tongue is badly scarred, or if there are many old scars around the forehead, it is strongly presumptive that the person has epilepsy. In the unconsciousness following an epileptic attack the pulse is good, the breathing is regular, the face is slightly pale, and the pupils are equal.

BRAIN INJURIES.

Concussion.—By concussion is meant a shocking or jarring of the brain substances such as follows a blow on the head.

Symptoms.—The symptoms are dizziness, nausea, and more or less loss of consciousness, depending upon the severity of the injury.

Treatment.—Place the person in a recumbent position with the head slightly raised and allow him to react. Stimulate by placing a few drops of ammonia water on a handkerchief and every minute hold it under the nose until the patient has taken one breath. Too much ammonia is very irritating hence the patient should be given only an occasional whiff of the gas. When he can swallow administer one-half a teaspoonful of aromatic spirits of ammonia in a little water. If there is a wound of the scalp, treat as directed on page 199.

Compression of the brain.—Compression of the brain may be due to a depressed fracture of the skull which ordinarily does not produce unconsciousness, or to a hemorrhage into the brain substance or between the brain and the skull. The compression due to hemorrhage is often characterized by unconsciousness coming on some time after the injury.

Symptoms.—At first the pulse may be slow and very strong, later it becomes rapid and weak. The breathing is very slow and of a peculiar snoring type. The lips may puff out when the breath is

expelled. The face is red and the skin dry. The pupils of the eyes are not equal, but one of them will be considerably larger than the other (fig. 324). There is also paralysis on one side of the body. It is difficult to detect paralysis in an unconscious person, but it may be done by comparing the way in which the arms or legs fall when they are slightly lifted from the ground.

APOPLEXY.

Apoplexy, or a stroke as it is sometimes called, is due to the spontaneous rupture of a blood vessel in the brain and the resulting hemorrhage into the brain substance. Apoplexy generally occurs in elderly individuals, especially those who are of the type known as full-blooded. Reference is often made to hardening of the arteries. which is a frequent cause of apoplexy. In certain persons the arteries lose their elasticity and actually become hard. The artery at the wrist may be felt through the skin, somewhat resembling a hard cord or a pipestem. When a general hardening of the arteries takes place throughout the body the blood pressure rises and the arteries are weaker than normal. The arteries in the brain are not supported by the surrounding tissues, hence rupture of a vessel is more apt to take place here than in other parts of the body.

Symptoms.—These are practically the same as those of compression. The patient suddenly or gradually becomes unconscious. The pulse is generally weak and rapid, but may at first be unusually slow and strong. The breathing is slow, the patient snores, and the lips and cheeks puff out at every expiration. The mouth is drawn to one side, and the patient, if he endeavors to talk, talks out of that side. The face is red and the skin warm. The pupils are unequal. If the patient is unconscious he can not be aroused. There is usually paralysis of one side of the body.

Wounds of the brain.—Severe head injuries may be accompanied with actual wounds of the brain or escape of the brain substance.

Symptoms.—These are varied, depending upon the location of the injury and the amount of damage done, but generally resemble either severe concussion, compression, or both.

Treatment.—First-aid treatment of compression of the brain, brain injury, and apoplexy is the same. Raise the head on a pillow, give plenty of fresh air. Send immediately for medical help. Pending the arrival of the doctor cold cloths may be laid on the head, if there is no wound of that region. *Do not in any case give alcoholic stimulants.*

After treatment.—In the absence of a physician these conditions should be treated by placing the patient in bed, elevating the head on a pillow, and apply an ice bag or towels wrung out in cold water to the head, if there is no open wound. If there is a wound apply a sterile

dressing first, and be careful that the cold applications do not wet the dressings. (See scalp wounds, p. —). Apply heat to the feet and legs. If the patient is conscious give a purgative and allow a very light liquid diet. (See also fractures of the skull, p. 255.)

SUNSTROKE AND HEAT EXHAUSTION.

Unconsciousness may be due to sunstroke or heat exhaustion. In *sunstroke* the face is red and the skin dry and hot. There is high fever and a strong pulse. In *heat exhaustion* the face is pale and the skin cold and clammy. There is no fever and the pulse is weak and rapid.

For further symptoms and the treatment of these two conditions, see page 172.

POISONING.

GENERAL COMMENTS.

The symptoms of poisoning depend upon what poison has been taken. Many poisons produce nausea, vomiting, purging, and collapse. Others bring on convulsions, or spasms, and a few cause the patient to become gradually unconscious without any other striking symptoms.

In endeavoring to determine what poison has been taken, if no information can be obtained from the patient, an examination of the surroundings may throw light on the case. An empty bottle may be discovered in the vicinity or some of the substance may have been spilled over the floor or clothing which can be smelled and otherwise examined. It may be ascertained that certain poisons were in the house and one of these may show signs of having been recently opened or handled. Always smell the breath and examine the mouth. The mouth may be stained or burned by certain chemicals in a characteristic way, such as follows drinking carbolic acid or other strong acids.

If the patient has taken a drug accidentally he will, of course, be willing to tell what it was, if he is conscious.

A skilled physician is often able to decide from the symptoms what poison has been taken, but this can not be expected of a layman. Always send immediately for a doctor if poisoning is suspected, but pending his arrival certain first-aid measures may be undertaken.

General treatment of all poisoning.—In the absence of a direct knowledge as to just what to do, the following line of procedure is recommended:

First. Give the antidote if it is known and available. Lacking the proper antidote, white of eggs, milk, or strong tea may be administered, as they will do no harm and are somewhat antagonistic to a number of common poisons.

Second. Get the poison out of the stomach as promptly as possible. After administering the antidote the stomach should be emptied as quickly as possible. The antidote is expected to combine with the poison and render it harmless, but it may not be effective, or the resulting mixture may be harmful if afterwards absorbed. To cause vomiting, tickle the back of the throat with the forefinger or give an emetic.

Emetics.—Emetics are substances which produce vomiting. The ones most available are luke-warm water mixed with mustard or common salt. A heaping teaspoonful of mustard or salt to a cupful of luke-warm water—stir it and have the patient drink the mixture. Repeat the dose every 10 minutes until 3 or 4 tumblerfuls have been swallowed if vomiting does not occur sooner. It is well to cause the patient to vomit several times and to have him drink freely of luke-warm water in the intervals. This process assists in washing out the stomach. One or two teaspoonfuls of sirup of ipecac or wine of ipecac are good emetics. Such preparations of ipecac are often kept in the home to administer to children with croup.

There are a few poisons in which it is not wise to give an emetic, but in an emergency, in the absence of a doctor and specific knowledge to the contrary, the general rule for giving an emetic holds.

Third. After giving the emetic and producing vomiting, the various symptoms which arise should be treated according to the nature of the case.

If the pulse becomes rapid and weak, hot coffee, one-half teaspoonful of aromatic spirits of ammonia, or small doses of whisky or brandy should be given. If the patient is greatly weakened and prostrated, as he generally will be, hot-water bottles should be applied around the feet and extremities and measures taken to sustain the general strength.

WARNING.—Poisons, such as carbolic acid or antiseptic tablets, should not be kept on the same shelf with harmless remedies. Such drugs should be kept in a separate place or in a special box and well out of the reach of children. Poisonous solutions should never be left in drinking glasses, as children or even adults may drink them without the knowledege of their dangerous character.

SPECIAL POISONS.

The treatment of a few of the commoner poisons will be described briefly.

CARBOLIC ACID.

Symptoms.—These come on very quickly. There is violent vomiting and purging, with pain in the stomach. The skin is drenched with sweat, the pulse is weak and rapid, and the patient goes into a

state of extreme prostration. The burns produced in the mouth by the pure acid are white areas surrounded by red edges. The crude acid produces black marks on the lips and in the mouth. The burns in the mouth and the odor of the drug will often enable one to decide what has been taken.

Treatment.—Give a heaping tablespoonful of Epsom salts dissolved in water. Wash the mouth out with whisky, brandy, gin, or alcohol and water, equal parts. After the rinsing have the patient swallow three or four tablespoonfuls of any of the above liquors diluted in water (adult doses). Alcohol is not an antidote, but checks the caustic action of the acid.

If the patient is not vomiting, give an emetic to free the stomach of what may be taken up by the alcohol. Put the person in bed. Give general stimulants, such as hot coffee, and apply external heat by hot-water bottles.

BICHLORIDE OF MERCURY OR CORROSIVE SUBLIMATE.

This substance is most used as a germicide and is frequently kept in houses for making solutions for washing wounds, etc. It is generally made into tablets with some coloring matter, red or green, and these tablets are commonly called antiseptic tablets. Bichloride of mercury is an extremely powerful poison, and many deaths both accidental and suicidal have been recently reported from taking this substance.

Symptoms.—A strong metallic taste in the mouth, intense pain in the stomach, with vomiting and free purging. Later extreme weakness and collapse. If the patient is tided over the acute symptoms, death may follow several days later from kidney failure.

Treatment.—The antidote is raw white of egg, which should be immediately given. Use two or more eggs. If eggs are not at hand finely chopped lean raw meat mixed with water or milk may be administered. Strong tea is also useful. It has been suggested that a man alone in the woods who accidentally swallowed a bichloride tablet might open one of his own veins and suck his own blood, as the albumen of the blood will form an antidote. After giving any of the above, excite vomiting by emetics. The albumen of the egg or meat unites with the mercury but will afterwards be absorbed, hence it is necessary to remove it. Put the patient in bed. Give more white of egg, barley water or thin cooked starch and apply external heat by water bottles. Give stimulants, such as hot coffee, if necessary.

Recently a number of chemical antidotes, which it was believed would neutralize the poison which had been absorbed into the system have been proposed. None of these, however, have apparently stood the test of animal experimentation satisfactorily.

OPIUM, LAUDANUM, MORPHINE, AND HEROIN.

These are all alike in their action and produce similar symptoms and are treated in the same way.

Symptoms.—At first drowsiness, later followed by complete unconsciousness. The pulse is at first slow and strong, later weak and rapid. The respirations are very slow. The patient may breathe only six times a minute. The face is red and dusky. The skin is warm and the pupils are contracted (fig. 322).

Treatment.—Give strong tea or permanganate of potassium, one-third of a teaspoonful dissolved in a pint of water. Then endeavor to induce vomiting by the finger in the throat or emetics. A cupful of very strong black coffee may be injected into the rectum by means of a fountain syringe. If conscious, give strong black coffee by the mouth. It is essential to keep the patient awake. This can be done by forcing him to walk supported by two assistants. Tickling in the ribs is also helpful, producing the same result. Inhalations of ammonia, strong coffee, 1/100 of a grain of atropine sulphate, or 1/30 of a grain of strychnine sulphate will assist in maintaining the heart. It may be necessary to use forceful measures to keep the patient awake for a number of hours. As long as the patient is awake he will continue to breathe, but if he is permitted to sleep, breathing is apt to stop. If breathing fails, use artificial respiration.

STRONG ACIDS, SUCH AS MURIATIC ACID, NITRIC ACID, OR SULPHURIC ACID.

These acids are frequently used in shops and factories for various commercial purposes and they may be accidentally swallowed.

Symptoms.—The mouth is burned by the acid, leaving brown or black stains. Similar marks are made if any of the substance is spilled on the clothing. The patient may go into collapse at once or in milder cases there is intense pain in the stomach, followed by vomiting and purging.

Treatment.—Give no emetic. Give as an antidote large drinks of water with chalk, magnesia, or baking soda. Plaster from the wall may be given in an emergency. Olive oil, raw whites of eggs, and thin starch are useful. After treatment consists of rest in bed, appropriate stimulants, and external heat.

LYE, AMMONIA WATER, OR OTHER STRONG ALKALIES.

Symptoms.—Intense pain in the stomach, nausea, and vomiting. Later followed in severe cases by collapse.

Treatment.—Give diluted vinegar, lemon juice or orange juice, or whites of eggs in water. It is not wise to give an emetic and patient will generally vomit without. The irritant effects of the poison

should be overcome by administering olive oil, milk, barley water, or flaxseed tea. Put the patient in bed and give general stimulants if needed. Keep up the body heat, applying hot-water bottles to the extremities.

TINCTURE OF IODINE.

Tincture of iodine is a common household remedy, but is poisonous internally and may be accidentally swallowed.

Symptoms.—Pain in the throat and stomach, vomiting and purging, the face is pale, and the pulse weak and rapid.

Treatment.—Give boiled starch or flour paste or mashed potatoes as an antidote. Empty the stomach by emetics. Administer stimulants, such as hot coffee or one-half a teaspoonful of aromatic spirits of ammonia every hour. Apply external heat by hot-water bottles. Afterwards give soothing and mucilaginous drinks, such as flaxseed tea, barley water, or tapioca gruel.

ARSENIC.

The various salts of arsenic, such as Paris green and others, are frequently used in sprays for trees or vegetables, for preserving skins, as the active agent in fly papers, and sometimes as poison for small animals.

Symptoms of arsenical poison.—These come on about an hour after the substance has been taken and resemble in many respects acute cholera morbus. There is pain in the abdomen and a feeling of constriction in the throat, accompanied with severe vomiting and profuse diarrhea. Later the stools are very thin, containing a few flakes of mucous and often streaked with blood. Finally great general weakness comes on, with shallow breathing and a very rapid and weak pulse. If the patient lives until the third day the symptoms may become very much milder at this time, only to be followed subsequently by a relapse, generally ending in death.

First-aid treatment.—The chemical antidote is prepared by stirring a teaspoonful of magnesia into a cup of water, adding 2 tablespoonfuls of tincture of iron, stirring well, and then giving the entire mixture as one dose. If magnesia is not available, ammonia water or aromatic spirits of ammonia may be added to any solution which contains iron, such as tincture of iron, the resulting precipitate collected by filtering it through several thicknesses of cloth placed in a funnel and then washing the precipitate by pouring clean water on the cloth until the smell of ammonia has disappeared. About 2 tablespoonfuls of this soft gelatinous mass should be mixed with water and administered by the mouth. The stomach should be emptied by emetics after the antidote has been given, or before if the antidote is not available. Magnesia alone is useful as an antidote in tablespoonful doses mixed with water.

After administering the antidote and producing vomiting give soothing gruels, such as flaxseed tea, thin cooked starch, tapioca gruel, and later two tablespoonfuls of castor oil to empty the bowels.

The general strength should be supported by artificial heat, plenty of bedcovers, and small doses of strong coffee. Pain in the stomach may be allayed by a hot-water bottle and doses of opiates, such as 10 drops of tincture of opium or a sixth of a grain of morphine sulphate.

STRYCHNINE.

Strychnine is often used as a poison for wolves, squirrels, and small animals and may, of course, also be kept in the house as a medicine.

Symptoms of strychnine poisoning.—These come on either suddenly or gradually. The patient, without warning, goes into convulsions or stiffness of the neck; a feeling of apprehension and muscular twitching may occur before the convulsions develop. The convulsions are very severe, and the body is often arched over backward like a bow, the patient resting only on the head and heels while attacked. The sufferer is conscious, greatly alarmed, and the corners of the mouth are drawn up, producing a sarcastic smile.

First-aid treatment.—Give several cups of strong tea as the chemical antidote and then excite vomiting by any of the previously mentioned emetics. After causing vomiting several times and washing out the stomach as thoroughly as possible in this way, give 40 grains of potassium bromide and 10 grains of chloral. This dose may be repeated at the end of two hours. If the convulsions prevent the administration of the medicine by mouth, it may be possible to give it by the rectum in the shape of a small injection. The patient should be kept in a dark room and very quiet, as any sort of stimulation may bring on the convulsions. Artificial respiration will sometimes be necessary.

PTOMAINE POISONING.

Certain kinds of bacteria when they grow in some foods, especially fish, shellfish, and mixtures of eggs with cream or milk, produce highly poisonous compounds called ptomaines. The eating of such contaminated food is followed by ptomaine poisoning. The formation of the ptomaines in food is favored by warm weather and long keeping.

Symptoms.—Headache, pain in the muscles, nausea, thirst, intense pain in the stomach, vomiting, and purging. The patient rapidly grows very weak and in severe cases goes into collapse. The symptoms may come on immediately after the food has been eaten or may not appear for some hours.

Treatment.—If vomiting has not occurred, give an emetic. Also administer a rectal injection of a pint of soapsuds to quickly empty the bowel. Follow the emetic in half an hour with a large dose of castor oil. Keep the patient in bed, administer stimulants if necessary, such as small doses of strong coffee or a tablespoonful of whisky every two hours. Surround the extremities with hot-water bottles. Keep the patient warm.

Vomiting can be held in check by small drinks of plain soda water, ginger ale, or of iced champagne if available. No food should be allowed until the acute symptoms have subsided, and then only a liquid diet in small quantities at first.

A characteristic feature of true ptomaine poisoning is that the patient remains weak for a long period and that recovery is very slow, oftentimes requiring several weeks.

MUSHROOM POISONING.

Certain varieties of mushrooms are highly poisonous, and if eaten produce severe illness and often death. There is no simple test for distinguishing the harmful kinds from the wholesome mushrooms, such as boiling them with a silver spoon, as is sometimes believed. To properly select the safe species of wild mushrooms from the poisonous ones requires a considerable knowledge of this subject, which can only be obtained by a careful study of textbooks.

Symptoms.—The first effects of poisonous mushrooms appear in from 6 to 12 hours after they have been eaten. They are headache, nausea, vomiting, pain in the stomach, and purging. Later on there is great thirst, muscular twistings or convulsions, the pulse is rapid and weak, and the skin cold and clammy. The patient may become delirious or go into a stupor.

Treatment.—The same as for ptomaine poisoning (p. 296). If atrophine sulphate is at hand or can be obtained, give 1/100 of a grain every three hours until three doses have been taken. If the patient is vomiting, a hypodermic tablet of atrophine can be placed under the tongue and it will be absorbed even if it is not swallowed.

GENERAL DIRECTIONS FOR AIDING THE INJURED.

In case of accident or sudden grave illness, humanity demands that those who happen to be present should take all possible measures for the relief of the afflicted person. It is entirely possible for any person of ordinary intelligence to master enough of the art of first aid so as to be able to give a great deal of valuable assistance pending the placing of the patient under regular medical care, and such help, if properly and promptly administered, may frequently in severe cases be the means of actually saving life. When a person is hurt or suddenlv becomes sick it is almost as important

to know what not to do as it is to know what to do, for ignorant volunteer assistants have often done their friends more harm than good by their ill-advised treatment. Knowledge of what is best to do in such emergencies can only be obtained by some training and the use of a great deal of common sense. It is therefore desirable that everyone should spend a moderate amount of time in studying at least one of the various manuals which have been prepared on this subject.

GENERAL RULES AS TO WHAT TO DO IN CASE OF ACCIDENT.

The conditions under which accidents happen vary so much that it is difficult to lay down rules which will be broad enough to cover all cases, but there are certain principles which should be followed in a general way when disasters of this sort occur.

First. A rapid preliminary survey of the person should be made to determine what must be done, first of all, in any particular case.

This preliminary examination should endeavor to ascertain whether the injuries can properly be classified as serious or trivial. If the person is conscious, this information can be at once obtained upon inquiry. If unconscious, the nature of the accident will almost always decide as to the probable gravity of the case.

Second. Note quickly the surroundings.

This is for the purpose of deciding on how soon additional help can be obtained and whether the individual is in danger of further injury from the nature of the place in which he is. A person may be hurt by a falling building, or be found in a room filled with gas, and it may be likely that further injuries may be received from the same source unless he is immediately moved, or it may be perfectly proper to permit him to remain for the present where the accident occurred.

Third. Now make a more careful examination of the patient to determine the location and nature of the injury.

Frequently in case of accident a glance at the injured person will be sufficient to determine where and how he is hurt. One leg may be doubled up in an unnatural position, part of the clothing may be torn or marked, as by the black streak left by a car wheel, or blood may be appearing on some part of the body. It may be necessary to partially undo some of the clothing to ascertain more correctly the amount and source of bleeding.

If the patient is unconscious, note the color of the face and the condition of the skin; take the pulse, examine the eyes, feel the head for a possible fracture of the skull, and observe the manner in which the patient is breathing, especially watching for puffing of the lips.

Fourth. Determine the proper course of action under the conditions present.

Having gotten some idea as to the nature and extent of the injuries, the amount of help available, and the general circumstances of the accident, all of which should not consume more than a minute or two, it is necessary to lay out and follow a definite plan of procedure, which will depend upon the data which has been obtained. If the person is bleeding very rapidly, that must be attended to without further delay. (See rules for checking hemorrhage, p. 204). If the loss of blood is not alarming, one can then proceed along the following lines:

If a doctor is within easy reach it may not be necessary to do more than to send one of the bystanders for him and make the patient as comfortable as possible pending his arrival. In sending for the doctor it is always best to give him as complete a statement of the nature and extent of the injury as is practicable. Then the doctor will know what instruments and other materials to bring with him. If circumstances permit, this information may be given in writing. If plenty of help is at hand another messenger should be immediately detailed to inform some one in authority of the accident. In a city, this would be the foreman of the shop or the superintendent of the plant; on board ship, the captain; in the street, the nearest policeman or police headquarters should be notified.

If the person is in a dangerous place or exposed to severe weather, it may be necessary to move him. If the danger is very imminent, this must be done at once, but all possible precautions should be taken to avoid increasing the damage already done, especially if there are any broken bones. In moving a person with a fracture the sharp ends of the bone may tear the flesh and even be driven out through the skin, creating a compound fracture, which is much more dangerous than a simple one. Having moved the patient, if absolutely necessary, or if it is decided to allow him to remain where he is pending the arrival of medical help, proceed to administer first aid, being guided by the following suggestions:

1. PLACING THE INJURED PERSON IN A PROPER POSITION.

Tight collars or belts should be loosened. The person should be kept in a recumbent or semirecumbent position. If the face is pale, lower the head and have the person lie horizontally. If the face is flushed the head may be raised on a folded coat, blanket, or other suitable material. If vomiting occurs, turn the head to one side so that the vomited matter will run out of the mouth and not flow down the windpipe, which may cause choking, and later, on inspiration, pneumonia. Do not attempt to force unconscious persons to drink water or stimulants, as they can not swallow.

2. REMOVE CLOTHING CAREFULLY.

In removing a coat or shirt to determine the amount of injury take the clothing off of the sound side first, and then it can be more easily removed from the affected part. This will avoid the danger of disturbing a fracture. It is sometimes advisable to cut the clothing off. In such a case cut along a seam or rip up a seam. Always cut the clothing when it is necessary to examine a badly injured or crushed limb.

In removing the clothing have a due regard for the proprieties and do not expose the patient unnecessarily.

3. TREAT THE MOST DANGEROUS CONDITION FIRST.

Always check serious hemorrhage before doing anything else. Put some sort of a dressing on a compound fracture before applying splints. Treat shock before dressing extensive burns. Be prepared to improvise headrests, tourniquets, splints, dressings, and stretchers out of material available.

4. PROTECT WOUNDS.

All wounds should be covered promptly with some sterile material, or if that can not be obtained the wound should be exposed to the air and the clothing fastened back out of the way, so that it will not rub against the wound or all over it.

5. BE ON THE LOOKOUT FOR SHOCK.

In severe injuries always examine for shock and administer suitable remedies if symptoms of shock are present. In this connection remember that keeping an injured person warm is of great importance, even though he is not in shock. It is a general rule in first-aid work to keep the head cool and the feet warm.

6. HANDLE THE CROWD.

Always see that the patient has sufficient air. Keep the crowd back and do not permit the curious or overzealous to disturb the patient. Objectionable bystanders who are needlessly exciting the sufferer can often be gotten rid of by sending them on errands, even if the errand is unnecessary.

7. ENCOURAGE THE PATIENT AS MUCH AS POSSIBLE.

A cheerful and hopeful attitude on the part of the assistants or bystanders is always beneficial to an injured person. Don't dwell on the accident or tell the patient how seriously he is hurt, but proceed quietly to do what is necessary without unnecessary consultation or

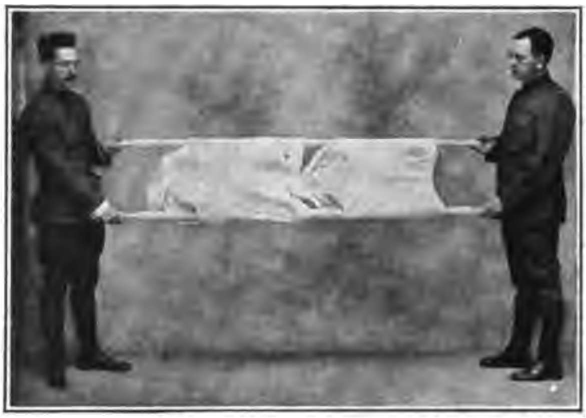


FIG. 329.—Coat stretcher.

FIG. 330.—Method of lifting patient with three assistants, step one.

FIG. 331.—Lifting patient with three assistants, step two.

FIG. 332.—Carrying patient in chair.

FIG. 335.—Patient lashed to stretcher.

FIG. 333.—Carrying patient on chair with poles.

FIG. 337.—Carrying patient. (Bearers grasping each other's nearest shoulder and clasping their outside hands.)

discussion with the patient. If the person is conscious, however, in every instance, ask him if he desires your assistance before undertaking to administer first aid.

Sometimes witnesses of accidents hesitate to go to the assistance of an injured person because they become sick or nauseated at the sight of blood. This feeling can generally be overcome by keeping busy and having the mind occupied with relief measures rather than dwelling on the horrors of the accident. Standing idly by an injured person may make even an experienced surgeon feel squeamish, but the moment he starts to work the feeling disappears.

In all cases of accident it seems hardly necessary to say that the one who is rendering assistance should absolutely retain his self-control and not give way to panic. Knowledge of what to do in such emergencies is of material aid in keeping one's self-possession. Such information may be obtained by a careful study of any of the books on first aid now available.

TRANSPORTATION OF THE INJURED.

The best method of transporting an injured person is in a wagon or motor truck. The bottom of the vehicle can be padded with hay, straw, clothing, or similar material, and the patient laid on this or a mattress. It is imperative in fractures of the thigh or upper part of the leg that the patient be stretched out at full length; also that he be reclining if he has shock or other serious constitutional symptoms. The great number of automobiles and taxicabs in use and the speed and smoothness with which they travel makes them especially applicable for cases where the patient may be allowed to assume a sitting position, such as injuries to the upper extremities or the foot. Frequently such modes of transportation are unavailable and then resource must be had to stretchers or litters.

Stretchers are appliances for moving the sick or injured and are borne by two or more persons. The essential parts of a stretcher are two stout poles about 8 feet long with a strip of some strong material fastened between on which the person lies. The ends of the poles act as handles. Regular stretchers (fig. 326) are the most convenient, but in an emergency similar appliances may be easily constructed in a number of ways. A very serviceable litter may be devised out of two gunny sacks and two suitable poles. Two holes are made in the bottom of the sacks at opposite corners. The poles are placed inside the bags, thrust through the holes, and the sacks drawn into place. Cross strips of wood may be lashed or nailed between the poles to hold them apart (fig. 327).

Another method is to lay a blanket on the ground and roll the outside edges around the poles and to continue the rolling until the

poles are about 20 inches apart. The blankets are then fastened by nailing them to the poles or tying securely with strips of strong twine (fig. 328). Canvas may be used in place of a blanket.

A coat stretcher is constructed out of two coats and two side poles. The coat sleeves are first turned inside out. The poles are thrust through the sleeves from the shoulder and the coats buttoned around the poles with the buttons down, making a webbing across (fig. 329).

If tools and lumber are available, an excellent stretcher may be constructed out of boards. Make the bed about 6 feet long and 18 to 20 inches wide. Suitable handles can be fastened to the ends or sides. Injured persons can be also carried on doors, shutters, benches, a short length of ladder, etc., but all rigid appliances of this sort must be padded with blankets, clothing, mats of straw, or some cushioning material.

Every improvised stretcher should be tested by placing a well man on it before it is used for an injured person.

A great many instructions have been written about the methods to be used in lifting a patient onto a stretcher. These are very useful for military forces and other trained bodies, but they are somewhat elaborate and likely to be forgotten in an emergency by the ordinary person. It is best, therefore, to depend largely on common sense, being especially careful to see that no additional harm is inflicted on the injured part.

Ordinarily place the stretcher alongside of the patient, who is on his back on the ground. If plenty of help is available, have one person raise the head and shoulders, another the hips, and a third the knees (figs. 330 and 331). These helpers stand or kneel on one side of the patient, with the stretcher on the other side. A fourth assistant stands on the opposite side, and his whole duty is to reach over the stretcher and handle and support the injured arm or leg.

If but two persons are present the head and shoulders may be lifted on the stretcher first. The helpers then change their position to the lower part of the body and lift the hips and legs onto the stretcher, guarding the injured part as carefully as possible.

When the patient is on the stretcher he should be well covered with blankets or clothing. Ordinarily the bearers can well dispense with their coats for this purpose. It makes no material difference whether he is carried feet or head forward except in going uphill or upstairs, when the head should always go first. The bearers should break step and proceed slowly. The stretcher handles should be supported by the arms hanging down and should not be borne on the shoulders. If obstacles are encountered it is best to try to go around them. If it is necessary to lift a stretcher over a fence, the leading bearers rest

FIG. 338.—Carriage by arms and knees.

FIG. 341.—Lifting partially unconscious person (2).

FIG. 339.—Carrying in arms.

FIG. 340.—Lifting partially unconscious person (1).

FIG. 342.—Lifting partially unconscious person (3).

FIG. 344.—Lifting partially unconscious person (5).

FIG. 343.—Lifting partially unconscious person (4).

FIG. 345.—Lifting partially unconscious person (6).

their handles on it first, the rear being supported by the others. Then the leaders cross the fence, and the stretcher is moved forward so that the rear end rests on the fence and the front is supported by the leaders. The rear men now go over and take their former positions.

It is impossible to handle a stretcher in trenches, narrow halls, ship's hold, or similar places. Under such circumstances the patient may be carried in a chair (fig. 332). Two poles or rifles may be lashed between the legs of the chair and used as handles (fig. 333). They are attached in such a way that the chair tips well backward when the handles are level. The poles should be sufficiently long to afford space for the bearers to walk without coming in contact with the patient.

A sling may be constructed by taking two blankets and rolling each of them up diagonally from one corner, making a large cylinder. The two rolls are then united by tying them together at the ends. The loops thus formed are slipped over the heads of the two bearers and allowed to rest on their shoulders, the middle parts of the blankets forming two slings. The patient sits on the sligs and steadies himself by placing his arms around the necks of the bearers.

FIG. 334.—Method of fastening poles to a chair in which bearers are on each side of patient.

Other devices for carrying men up ladders or hoisting them perpendicularly on stretchers are used in mines and on board naval vessels.

Occasions may arise when it is impossible to take sufficient time to obtain a stretcher or other appliance for carrying an injured person. as for example in a burning building, or a room filled with gas, or on the battle field, when an engagement is in progress. Under such circumstances it is necessary for the helpers to carry the patient without the assistance of any apparatus. If there are two bearers a man may be carried for a short distance on what is known as the "lady's chair." This is formed by each bearer grasping his left wrist with his right hand. The free left hand then grasps the right wrist of the other assistant (fig. 336). The injured person sits on the support thus formed and places his arms around the necks of the operators. Another method is for the bearers to stand side by side and each grasps the other's nearest shoulder. The outside hands are clasped

together, and the patient sits upon these. The other arms act as a backrest (fig. 337). An unconscious man may be carried for a short distance by the forward bearer standing between the legs and seizing the knees, and the rear bearer supporting the shoulders by putting his hands in the patient's armpits (fig. 338).


FIG. 336.—Lady's chair.

It is extremely difficult for one person to carry a patient for a considerable distance. If the patient is conscious, he may be carried on the back with his arms around the neck of the bearer and his thighs supported by the bearer's forearms in the manner known to children as "piggy-back." The greatest difficulty, however, comes when a single bearer attempts to pick up an unconscious person. It is, of course, practicable to lift a child or a very small adult in the arms (fig. 339), but with a heavy individual this is impossible for a man of ordinary strength.

METHODS OF CARRYING AN UNCONSCIOUS PERSON BY ONE OPERATOR.

Various methods are described for getting unconscious persons onto the bearer's back in order to transport them. An unconscious individual, however, is as limp as a wet towel, and, although he may be lifted to his knees without great difficulty, he is apt to fall forward on the face as soon as the bearer's grip is shifted below the hips.

If the patient is only partially unconscious and capable of stiffening himself a little, he may be gotten on the bearer's back by the following maneuvers:

First, turn the patient on his face. Stand astride of the body at the hips. Place the hands under the patient's armpits and raise him to the knees (fig. 341). Work the hands downward along the chest until they reach the abdomen and then lift him to his feet. Holding him in this position with the right arm, grasp his left wrist with your left hand, lower your head, and pull his left arm around your neck (fig. 343). Now work the right foot forward in front of his legs, bending forward so that the body is supported on your back. Now put your right hand in front and pass it between the unconscious person's legs, grasping his right thigh above the knee from behind (fig. 344). With a sudden motion throw the patient onto your own

back. Shift him further onto the back, release his left wrist, and grasp his right wrist with your left hand (fig. 345). The unconscious person is now on the back of the helper and can be carried without great difficulty.

The maneuver of getting the patient on the back is a difficult one, and should be frequently practiced with a person who has made himself limp for the purpose. It is well to begin on a half grown-up boy in order to acquire skill before attempting to practice it on an adult.

76912°—19——25

APPENDIX.

LIST OF REMEDIES MENTIONED IN THIS BOOK AND THEIR USES.

DOSES.—Unless otherwise stated, the doses mentioned in this book are intended for adults. To determine the dose for children, add 12 to the age of the child and divide the age of the child by this sum. This fraction will represent the size of dose compared with that for an adult. For example, a child 6 years old will require $\frac{6}{6+12}=\frac{6}{18}$, or one-third of the adult dose.

CAUTION.—Preparations containing opium, such as laudanum, paregoric, camphor and opium pills, Sun Cholera Mixture tablets, etc., should not be used except where absolutely necessary, as their continued use is liable to produce the drug habit.

Alcohol.—Externally is useful as a mild antiseptic wash for wounds. As a liniment, pure or diluted with from 1 to 3 parts of water, is cooling and stimulating.

Argyrol.—Useful, in 10 to 20 per cent solutions, as drops for sore eyes, also as injection for gonorrhea.

Aromatic spirit of ammonia.—Useful in hysteria, faintness, headache, flatulent colic, nervous debility, and as a stimulant in shock. Dose: ½ to 1 teaspoonful in water every half hour until three doses are taken.

Aspirin (5-grain tablets).—Useful in rheumatism, neuralgia, cramps in stomach, colic, and headache. Dose: 1 to 2 tablets with hot water or tea every three hours.

Atropine sulphate (poison) (1/120-grain tablets).—Useful in night sweats, shortness of breath when due to heart disease, mushroom poisoning. Dose: 1 tablet.

Belladonna plaster.—Useful in coughs, colds, rheumatism in joints and arms, lumbago, and pains in small of back. Should be worn only long enough to have the desired effect. If the throat becomes dry or the pupils dilated, indicating belladonna poisoning, the plaster should be removed.

Bicarbonate of soda (baking soda).—Internally useful in sour stomach and heartburn. Dose: ½ to 1 teaspoonful in half tumbler of water. Repeat in half an hour if necessary.

Bichloride of mercury tablets (poison) (7.3 grains each).—One tablet dissolved in from 2 to 5 pints of water makes a powerful and

efficient solution for washing and dressing wounds, sores, and boils. Do not use internally.

Bismuth subnitrate (5-grain tablets).—Useful in dysentery, diarrhea, and heartburn. Dose: 2 to 4 tablets every three hours. (Crush before taking.)

Borax.—Useful in sore mouth. One tablespoonful dissolved in a pint of water and used as a mouth wash several times a day.

Boric acid (boracic acid).—One-half teaspoonful may be dissolved in a glass of water and used as a lotion for the eyes or ears.

Bromide of potash (5-grain tablets).—Useful in neurasthenia, convulsions, and delirium tremens: Dose: 3 to 5 tablets, dissolved in water, three times a day.

Brown-mixture lozenges.—Useful in bronchitis, coughs, and colds. Dose: 1 lozenge allowed to dissolve slowly in mouth; to be repeated as required.

Calomel ($\frac{1}{10}$-grain tablets).—Useful in constipation and dysentery. Dose for adults and children: Take 2 tablets every 15 minutes until 20 tablets are taken. When from 4 to 6 hours have elapsed a Seidlitz powder or a dose of Rochelle or Epsom salt should be taken. The dose of the Seidlitz powder or salt should be proportionate to the age of the patient.

Camphor and opium pills (poison).—Useful in relieving pain in diarrhea and dysentery. Dose: 1 pill every three hours until 4 are taken.

Camphorated oil (for external use only).—In sprains, bruises, neuralgia, rheumatism, and pains and swellings of the breasts or joints it should be gently rubbed on the painful part. Applied on hot flannel to chest and neck for colds.

Carbolic acid, liquid (poison).—Useful as an antiseptic and disinfectant when mixed in the proportion of 1 part of acid to 100 parts of hot water. Useful without dilution to arrest the development of boils and carbuncles and as an application to ulcers and venereal sores. Should be applied cautiously. The surface should be merely touched with a small piece of cotton moistened with a drop of the acid, care being taken not to burn the surrounding skin. Do not use internally.

Castor oil.—Useful in constipation. Dose: 1 to 2 tablespoonfuls.

Chlorate of potash (5-grain tablets).—Useful in sore throat and sores in mouth. Directions: Dissolve 5 or 6 tablets in a wineglass of water and use as a gargle or mouth wash.

Compound cathartic pills, vegetable.—Useful in constipation. Dose: 1 to 3 pills at night.

Compound solution of cresol.—Useful as antiseptic and disinfectant when mixed with water in from 1 to 3 per cent solutions. (See pp. 104 and 188.) Do not use internally.

Cough mixture—Mistura pectoralis (expectorans) N. F.—Stimulating expectorant. Useful in coughs and colds. Dose for an adult: ½ to 1 teaspoonful.

Cream of tartar.—In small doses (1 to 2 teaspoonfuls in sweetened water) acts as a cooling aperient, gently opening bowels. In large doses (1 to 2 tablespoonfuls) is a hydrogogue cathartic, causing free, watery stools.

Creosote, beechwood (poison).—Useful in toothache; 1 or 2 drops on a piece of absorbent cotton introduced into the clean cavity, care being taken that it does not come in contact with the gums, tongue, or cheek. Do not use internally.

Epsom salt.—Useful in constipation and dysentery. Dose: 1 to 2 tablespoonfuls dissolved in as little water as possible. A little lemon juice and sugar may be added to disguise somewhat its bitter taste.

Essence of peppermint.—Useful in cramps, colds, gas in stomach, and colic. Dose: 10 drops to ½ teaspoonful in sweetened water or on sugar. Externally is useful in rheumatism, neuralgia, and toothache.

Flaxseed meal.—Useful as hot poultice to apply to boils and felons. Compresses wet with hot bichloride solution, 1 tablet to 5 pints of hot water, are better. To prepare flaxseed poultice a receptacle containing boiling water should be placed on the fire, the flaxseed meal should be gradually added and constantly stirred until the batter is jellylike. This should be evenly spread, with a thickness of from ¼ to ½ inch, to within 2 or 3 inches of the border of a cloth prepared for that purpose by folding in two or three layers. To prevent the poultice from adhering to the skin any of the following may be placed on its surface: Gauze, mosquito netting, cheesecloth, vaseline, or sweet oil.

Formalin (poison).—Used as a disinfectant generally in connection with permanganate of potash, as follows: For every 1,000 cubic feet of room space to be disinfected use ½ pound of permanganate of potash, powder or crystals, and from 1 to 1¼ pints of formalin. Add the permanganate of potash to the formalin contained in a deep tin pail. Effervescence begins at once, the room is tightly closed, and the operation is over in about 10 minutes. After 12 hours the room is opened and aired.

Glycerin.—Is a mild and healing application for sores, chaps, etc. When mixed with an equal quantity of water is useful in earache, hard, irritated, or feverish skin, chapped face or hands, split lips, and chafing.

Iodide of potash (5-grain tablets).—Useful in syphilis. Dose: 1 tablet dissolved in water three times a day after meals.

Laudanum (poison).—Useful in easing pain in dysentery and cholera morbus. Dose: 5 to 30 drops.

Lead and opium wash (*poison*) (*shake well before using*).—Soothing external application in sprains and bruises.

Lemon juice.—Useful in fevers and inflammatory complaints. Hot lemonade on retiring is useful to aid in the relief of a cold in its first stages.

Lime water.—Internally is useful in soothing sick stomach, heartburn, diarrhea, and in dyspepsia attended with acidity of the stomach. Dose: 1 to 3 tablespoonfuls. For sick stomach, to be repeated after each effort to vomit. Externally as liniment (mixed with an equal quantity of linseed, cottonseed, or olive oil) for burns and scalds.

Magnesia, calcined, heavy.—Useful in sick headache, dyspepsia. sour stomach, and heartburn. Dose: ⅓ to 1 teaspoonful 1 hour after meals, and, being mildly laxative, for constipation in doses of ½ to 1 teaspoonful.

Menthol.—Useful in oily solutions (menthol 3 grains, liquid petrolatum 1 ounce) as cooling drops in nose in colds in the head. Ten drops should be placed in each nostril with a medicine dropper.

Morphine sulphate (*poison*) (*¼-grain tablets*).—Useful to relieve pain and spasm. Should be used cautiously. Should not be repeated in less than 2 hours, and then not unless pain is very severe. Dose: 1 tablet.

Mustard.—Externally is useful to draw the blood to the surface in case of pain where skin is not broken. Should be employed as a plaster or poultice, made as follows: 1 part of mustard is thoroughly mixed with from 2 to 4 parts of flour and made into a paste by the addition of a small amount of tepid water. This is then spread thinly to within 1 or 2 inches of the border of a cloth prepared by folding in two or three layers of old cotton cloth. The amount of mustard depends upon the degree of pain, the age of the patient, etc. Care should be taken that the mustard does not blister the skin. As a rule, mustard plasters or poultices should not be applied to children and old people, as they may blister the surface. Internally given to produce vomiting, 1 tablespoonful stirred to a cream with a cupful of tepid water.

Oil of cloves (*poison*).—Useful in toothache, being applied the same as creosote. (See above.)

Olive oil (*sweet oil*).—Internally is useful in constipation. Dose: 2 to 3 tablespoonfuls. Externally is a soothing application to blistered, burned, scalded, or other injured surfaces, also to piles.

Oil of wintergreen (*methyl salicylate*).—Useful, when mixed with an equal amount of olive oil, as an application for the relief of neuralgia, rheumatism, and painful joints. The oil should be gently rubbed on the painful area. If used about the head care should be taken that none gets into the eyes.

Paregoric (*poison*).—Useful in quieting cough and relieving pain in the stomach and bowels and to check diarrhea. Dose: 1 to 2 teaspoonfuls.

Permanganate of potash.—Useful in gonorrhea as an injection: ¼ teaspoonful dissolved in 2 quarts of water. One teaspoonful to a quart of water makes an efficient wash for perspiring feet. Useful in snake-bites in the form of a concentrated solution which should be injected freely and immediately into and around the part which has been bitten. Useful as a general antiseptic in solution (1 tablespoonful dissolved in a quart of water). As a disinfectant, see "Formalin."

Peroxide of hydrogen solution.—Is cleansing and slightly antiseptic. Useful as a gargle in sore throat, diluted with an equal quantity of water. Useful to apply to wounds, boils, and abscesses, after diluting with from 1 to 3 parts of water.

Picric acid (*poison*) *dissolve in water* (*½ per cent solution*).—Useful to wet dressings with, as an application to burns.

Quinine sulphate (*5-grain tablets*).—Useful in malaria, colds, and as a general bitter tonic. Dose: 1 tablet three times daily. Dose as tonic: ½ of a tablet three times a day.

Salicylate of soda (*5-grain tablets*).—Useful in rheumatism, neuralgia, and headache. Dose: 1 to 2 tablets every three hours.

Salol (*5-grain tablets*).—Useful in diarrhea, dysentery, rheumatism, and fermentative dyspepsia. Dose: 1 tablet three times a day.

Sirup of ipecac.—Useful in croup, bronchitis, cough, and hiccough. Dose: 10 drops every three hours. Also used to produce vomiting in doses of 1 to 2 tablespoonfuls.

Soap liniment (*for external use only*).—Useful in rheumatism, sprains, and bruises.

Spirit of Camphor.—Internally is useful in nervous diarrhea, colic, and cramps. Dose: 5 to 30 drops, first added to sugar and then mixed with water.

Strychnine sulphate (*poison*) (*$\frac{1}{30}$-grain tablets*).—Is a bitter tonic and stimulant and is useful in anæmia and dyspepsia. Dose: 1 tablet three times a day.

Sun Cholera Mixture (*poison*) (*15-minim tablets*).—Useful in diarrhea, dysentery, and cholera morbus. Dose: 1 tablet.

Sweet spirit of niter.—Useful in fevers, flatulent colic, and colds. Dose: ½ teaspoonful in sweetened water every four hours.

Tincture of green soap.—Cleansing hands.

Tincture of iodine (*poison*) (*for external use only*).—Useful to disinfect wounds; should be diluted with an equal quantity of alcohol or water. If painted over inflamed surfaces, will sometimes be of value.

Tincture of iron.—Useful as a tonic. Dose: 10 drops largely diluted with water, three times a day. Rinse mouth after taking. Should be taken through a straw.

Tincture of myrrh.—Useful in diseased gums and sore throat. Directions: For spongy and bleeding gums, apply with a sponge or soft brush. For sore throat, use as a gargle, 1 teaspoonful in a cupful of water.

Turpentine.—Used in the form of hot turpentine stupes in typhoid fever, pneumonia, colds, bronchitis, lumbago, pleurisy, and inflammation of the bowels. The stupes are prepared by wringing a double layer of thin flannel out of a pint of hot water with which a teaspoonful of turpentine has been mixed. These applications should not be prepared too close to a fire on account of the inflammability of the turpentine.

Unguentine.—Useful in burns, scalds, and inflammation. Spread on linen or cotton cloth and apply.

Vaseline.—Internally and externally useful for the relief of cold in the chest. Externally useful in cold in the head, soothing irritated surfaces, burns, and scalds, and as a protective dressing.

Zinc sulphate (poison).—Useful in gonorrhea as an injection, made in the proportion of $\frac{1}{4}$ teaspoonful to 1 pint of water. Is given internally in doses of $\frac{1}{4}$ to $\frac{1}{2}$ teaspoonful dissolved in water to produce vomiting.

LIST OF MEDICAL AND SURGICAL SUPPLIES FOR MEDICINE CHESTS.

Medical supplies.

For vessels.	For homes and factories.	Item.
1 pound	1 pound	Absorbent cotton.
1 pint	$\frac{1}{2}$ pint	Alcohol.
2 ounces	2 ounces	Argyrol, 10 per cent solution.
$\frac{1}{2}$ pint	4 ounces	Aromatic spirit of ammonia.
100	100	Aspirin, 5-grain tablets.
1 tube	1 tube	**(Poison.)** Atropine sulphate $\frac{1}{150}$ grain.
1 yard	1 yard	Belladonna plaster (1 year).
4 ounces	4 ounces	Bicarbonate of soda (baking soda).
100	100	**(Poison.)** Bichloride of mercury, antiseptic tablets of 7.3 grains each One tablet to a pint of water makes solution 1 part of bichloride to 1,000 of water.
100	100	Bismuth subnitrate, 5-grain tablets.
$\frac{1}{2}$ pound	4 ounces	Borax.
1 pound	$\frac{1}{2}$ pound	Boric acid (boracic acid), powdered.
100	100	Bromide of potash, 5-grain tablets.
100	100	Brown Mixture lozenges.
100	100	Calomel and soda tablets, each $\frac{1}{10}$ grain of calomel and $\frac{1}{10}$ grain of bicarbonate of soda; amber-colored bottle (1 year).
		Calomel and soda tablets, each $\frac{1}{2}$ grain of calomel and 1 grain of bicarbonate of soda; amber-colored bottle (1 year).
100	100	**(Poison.)** Camphor and opium pills.
$\frac{1}{2}$ pint	4 ounces	Camphorated oil.
1 pint	$\frac{1}{2}$ pint	**(Poison.)** Carbolic acid, liquid, pure.
1 pint	$\frac{1}{2}$ pint	Castor oil.
100	100	Chlorate of potash, 5-grain tablets.
100	100	Compound Cathartic Pills, vegetable.
1 pint	1 pint	Cough mixture, Mixtura pectoralis (expectorans) N. F.

Medical supplies—Continued.

For vessels.	For homes and factories.	Item.
1 pint	1 pint	**(Poison.)** Compound solution of cresol.
1 ounce	½ ounce	**(Poison.)** Creosote, Beechwood.
1 ounce	1 ounce	Ear drops, formula: Carbolic acid, 1 fluid dram; glycerin, 7 fluid drams; well mixed.
2 pounds	1 pound	Epsom salt.
4 ounces	2 ounces	Essence of peppermint.
1 pound	½ pound	Flaxseed meal (linseed meal).
1 pint	1 pint	**(Poison.)** Formalin (1 year).
1 pint	½ pint	Glycerin.
100	100	Iodide of potash, 5-grain tablets.
4 ounces	2 ounces	**(Poison.)** Laudanum (1 year).
1 pint	½ pint	**(Poison.)** Lead and opium wash. Shake well before using.
½ pound	4 ounces	Magnesia, calcined, heavy.
2 ounces	2 ounces	Menthol solution; Menthol, 3 grains; liquid, petrolatum, 1 ounce.
1 tube	1 tube	**(Poison.)** Morphine sulphate, ½ grain.
½ pound	4 ounces	Mustard.
1 ounce	½ ounce	**(Poison.)** Oil cloves.
1 pint	1 pint	Olive oil (sweet oil).
½ pint	½ pint	**(Poison.)** Oil of wintergreen (methyl salicylate).
½ pint	4 ounces	**(Poison.)** Paregoric.
100	100	Permanganate of potash, 5-grain tablets.
1 pint	1 pint	Peroxide of hydrogen solution (1 year).
1 pint	½ pint	**(Poison.)** Picric acid, ½ per cent solution.
100	100	Quinine sulphate, 5-grain tablets.
100	100	Salicylate of soda, 5-grain tablets.
100	100	Salol, 5-grain tablets.
½ pint	4 ounces	Sirup of ipecac.
1 quart	1 pint	Soap liniment.
100	100	**(Poison.)** Strychnine sulphate, 1/30 grain tablets.
100	100	**(Poison.)** Sun Cholera Mixture, 15-minim tablets.
½ pint	4 ounces	Sweet spirit of niter, dark-colored bottle (1 year).
1 pint	½ pint	Tincture of green soap.
½ pint	4 ounces	**(Poison.)** Tincture of iodine (1 year).
½ pint	4 ounces	Tincture of iron.
½ pint	4 ounces	Tincture of myrrh.
1 pint	½ pint	Turpentine.
1 pound	½ pound	Unguentine (for burns, scalds, etc.).
1 pound	½ pound	Vaseline.

These medicines will remain serviceable until used if kept in glass-stoppered bottles, with the exception of those marked "1 year," which should be renewed after that interval. The containers of all articles marked "1 year" should be plainly marked with the date on which such articles are received.

For bulky articles not over a pint of each need be kept in the medicine chest.

Special bottles with a rough surface must be used for poisonous medicines. These bottles must be plainly marked **POISON**.

Surgical supplies, etc.

For vessels.	For homes and factories.	Item.
2	1	Adhesive plaster, 10-yard reel, 1 inch wide.
2 dozen	1 dozen	Applicators, small, wooden.
1	1	Atomizers. De Vilbiss.
1 dozen	1 dozen	Bandages, 2-inch by 3-yard (½ dozen gauze and ½ dozen muslin).
1 dozen	1 dozen	Bandages, 2-inch by 5-yard (½ dozen gauze and ½ dozen muslin).
1 dozen	1 dozen	Bandages (4-inch by 5-yard (muslin).
4	2	Bandages, plaster of Paris, 3-inch. Each contained in an air and moisture proof container.
6	6	Bandages, triangular (Esmarch's bandage), with figures printed on them showing the various ways they can be used.
1	1	Bistoury.
6	3	Camel's-hair brushes.
1	1	Catheter, rubber, No. 20 F. (1 year).
1	1	Corkscrew.
1	1	Forceps, artery (hemostatic forceps). This can be used to grasp a bleeding vessel until it can be tied, or until the doctor arrives. A catch holds the grip of the forceps. Sterilize by boiling.
1	1	Forceps, dressing or dissecting. Will be found convenient in cleaning up a wound and applying dressings; also in removing splinters, etc. Sterilize by boiling.
1	1	Fountain syringe, 2-quart (1 year).
6	6	Urethral syringes, glass.
10 yards	5 yards	Gauze, picric acid. Good dressing for wounds and scalds.
10 yards	5 yards	Gauze, plain, sterile.
1	1	Hot-water bottle, rubber, 2-quart (1 year). Metal bottle preferred.
6	6	Medicine droppers.
1	1	Medicine glass.
2	2	Nail brushes.
2 dozen	2 dozen	Safety pins, large.
1	1	Scissors, dressing, surgeon's, for cutting gauze and bandages. Sterilize by boiling.
1	1	Shears, for cutting cotton and muslin, etc.
6	3	Splints, wooden. Straight and angular splints made of thin board, as described in chapter on "Fractures."
1	1	Spool of silk ligature, medium size.
2	2	Surgical needles, in glass-stoppered bottles.
1	1	Thermometer, clinical, Fahrenheit.
1	1	Tooth forceps, incisor.
1	1	Tooth forceps, molar.
4 pieces	2 pieces	Wire gauze, made of heavy mesh malleable wire. When well padded, can be wrapped around a fracture for temporary dressing.
4 sheets	2 sheets	Yucca palm (a thin fiber board). Can be wrapped around a fracture for temporary dressing.

Gauze and bandages should be in paraffin-paper packages, sealed after sterilization.

Catheters and other rubber goods should be in sealed paraffin packages or envelopes, slightly dusted with sterile talcum on the inside of the package.

Scissors and instruments, if not in cases, may be coated with paraffin, which will come off when dipped in hot water.

Articles marked "1 year" should be discarded after that interval and new ones obtained. The containers of all articles marked "1 year" should be plainly marked with the date on which such articles are received.

INDEX.

	Page.
Abrasions	197
Abscess	176
Accumulation of wax in ears	180
Acute alcoholism	287
Acute nephritis	170
Acute rheumatism (rheumatic fever)	116
Alcohol as a food	78
Alcohol as a medicine	78
Alcohol as a stimulant	78
Alcoholic liquor	77
Alkali poisons, antidote for	234
Apoplexy	290
Appendicitis	169
Applying splints	248
Arsenic, antidote for	295
Arterial hemorrhage	208
Artesian wells	85
Artificial illumination	21
Artificial respiration	276
Bandages and bandaging	222
Baths	81
Bath, infants	97
Bedbugs	60
Bee sting	202
Beef tapeworm (Taenia saginata)	148
Beriberi	146
Bichloride of mercury or corrosive sublimate poisoning	293
Bites of cats and other small animals	204
Bites and stings of poisonous animals or insects	200
Black eye	283
Bleaching powder for purifying water	82
Bleeding	204
Bleeding from special parts	215
Bleeding from varicose veins of the leg	206
Boils	175
Bottle feeding of infants	90
Boxed can privy	41
Brain injuries	289
Break-bone fever (dengue)	139
Breast pang (angina pectoris)	161
Broken neck or back	258
Bronchitis	157
Broncho-pneumonia	159
Bruise	283
Bruises with wounds of the skin	284
Brush burn	198
Bubo, venereal	158
Bullet wounds	198
Burns and scalds	269
Burns from carbolic acid	273
Burns from chemicals, such as strong acids or alkalies	272
Burns of the eye by chemicals	273
Camp sanitation	68

	Page.
Camp structures	69
Carbolic acid poisoning	292
Carbon monoxide	22
Care of the baby	87
Care of the feet	83
Care of the mouth and teeth	81
Care of the sick	102
Carrel-Dakin solution	192
Catheterizing	157
Cause of inflamed wounds	181
Causes of unconsciousness	286
Chancre	153
Chicken pox	122
Childbirth (labor)	84
Cholera (epidemic cholera, Asiatic cholera)	141
Cholera morbus (sporadic cholera)	166
Chronic nephritis	170
Chronic rheumatism	117
Cisterns	39
Cleaning	48
Cleaning of buildings	48
Clothing	80
Clothing of infants	97
Coal gas	22
Colds	157
Cold air	25
Cold baths	103
Colic	167
Colic, infantile	93
Compound fractures	267
Compression of the brain	289
Concussion	289
Condensed milk	94
Conjunctivitis	177
Constipation	165
Constipation of infants	93
Construction of buildings	17
Construction of vessels	61
Consumption (tuberculosis)	129
Contagious diseases among children	99
Convulsions	174
Cook tent	69
Coughs and colds	157
Covered can privy	41
Crepitus or grating	246
Croup	158
Croup kettle	158
Daily quantity of food	74
Daily quantity of water required	30
Delirium tremens	171
Description of germs	182
Description of wounds	181
Diarrhea	166
Diarrhea of infants	93
Diet	74

	Page.
Diet for the sick	108
Diphtheria	118
Directions for taking temperature	103
Directions to be followed in case of poisoning	293
Disinfecting solutions	104
Disinfection of clothing	104
Disinfection of room	124
Disinfection of water supplies	70
Disinfection of wounds	187
Dislocations	241
Dislocation of collar bone or clavicle	243
Dislocation of the fingers	242
Dislocation of the lower jaw	242
Dislocation of the shoulder	242
Dislocation of the thumb	242
Disposal of refuse	48
Dog bites	202
Drafts	25
Draw sheet	103
Dressing and treatment of wounds	189
Driven wells	38
Dropping medicine in the eye	236
Drowning	279
Dust as a cause of disease	27
Dysentery	108
Dyspepsia	164
Earache	179
Effects of alcholic liquor	77
Effects of cold air	25
Effects of cold—frostbite	274
Effects of heat and cold	269
Electric burns	273
Electric light	22
Electric shock	282
Emetics	292
Erysipelas (St. Anthony's fire)	112
Exercise	79
Fainting	161, 287
Fatigue	80
Figure-of-eight bandage	233
Filter bed	32
Fireplaces	28
First aid to the injured	181
First-aid packets	190
Fish-tail burners	23
Fits	288
Fleas	57
Flies	50
Floor coverings	48
Foot bath	103
Foot candle	21
Foreign bodies in the ear	237
Foreign bodies in the eye	235
Foreign bodies in the gullet	237
Foreign bodies in the larynx	238
Foreign bodies in the nose	236
Foreign bodies in the pharynx	237
Foreign bodies in the throat	237
Four-tailed bandage	229
Fractures	245
Fractures of the arm	254
Fractures of the base of the skull	255
Fracture of the bones of the hand	251
Fracture of the bones of the foot	267
Fracture of the bones of the leg	265

	Page.
Fracture of the collar bone	257
Fractures around the elbow joint	253
Fracture of the fingers	251
Fractures of forearm	252
Fracture of the knee cap	264
Fractures of the lower extremities	259
Fracture of the lower jaw	256
Fracture of the nose	256
Fracture of the ribs	257
Fracture of the skull	255
Fracture of the thigh bone	260
Fractures of the toes	267
Fracture of the wirst	252
Gallstones	16[illegible]
Garbage disposal	71
Gargle	12[illegible]
Gas poisoning	284
General rules as to what to do in case of accident	298
German measles	127
Germicides and antiseptics	1[illegible]
General antidote	29[illegible]
General directions for aiding the injured	297
Germs in water	3[illegible]
Glare	[illegible]
Gonorrhea (clap)	154
Gonorrheal rheumatism	11[illegible]
Grades of milk	75
Gravel	16[illegible]
Gumboil	81
Headache	174
Heart disease	16[illegible]
Heating	[illegible]
Heating of buildings	[illegible]
Heat cramps	17[illegible]
Heat stroke	172
Hemorrhage	2[illegible]4
Hemorrhage into the abdomen	219
Hemorrhage from the face and forehead	215
Hemorrhage from the lungs	218
Hemorrhage from the neck	216
Hemorrhage from the nose	217
Hemorrhage from the palm of the hand	217
Hemorrhage from piles	218
Hemorrhage from the scalp	215
Hemorrhage from the stomach	218
Hemorrhage from a tooth socket	21[illegible]
Hemorrhage from the trunk	217
Hernia	[illegible]
Heroin, antidote for	294
History of illness	10[illegible]
Home modification of milk	91
Hookworm (Nercator americanus)	15[illegible]
Hot-air furnaces	[illegible]
Hot-water and steam pipes	[illegible]
Hot-water bottles	10[illegible]
Hours of labor	[illegible]
How to prevent consumption	131
How to produce sweating	173
Humidifiers	[illegible]
Humidity of the air	[illegible]
Hydrophobia, symptoms of	20[illegible]
Ice for cooling drinking water	64

	Page.
Illuminating gas	22
Impacted fractures	246
Improvised bandages	230
Incised wounds	183
Indigestion	164
Infected wounds	184
Inflamed leg ulcers	196
Inflamed wounds	194
Inflamed wound of the hand	195
Influenza	112
Injuries to joints	240
Insect stings	202
Instructions for saving drowning persons by swimming to their relief	279
Intestinal parasites in water	80
Iritis	177
Isolation in disease	103
Itch-mite (Scarcoptes scabiei)	59
Kidney disease	170
Kidney stone	168
Lacerated wounds	183
La grippe	112
Lamps	21
Large cuts	191
Laudanum, antidote for	294
Lead colic	167
Lice	58
Lighting	20
Lighting of buildings	20
Lightning shock	282
List of medical and surgical supplies	312
List of remedies	307
Lockjaw	196
L. R. S. privy	41
Lye, ammonia water, or other strong alkalies; poisoning	294
Malarial fever	133
Many-tailed bandage	229
Measles	123
Mess tent	69
Method of taking patient's temperature	103
Milk	75
Milk bottles	95
Mixed feeding of infants	90
Model well	83
Morphine, antidote for	294
Mosquitoes	54
Mosquito and flea bites	204
Mosquitoes on vessels	64
Mother's milk	88
Mumps	128
Muriatic acid, antidote for	294
Muscular rheumatism	118
Mushroom poisoning	297
Nasal spray	140
Natural gas	22
Natural ventilation	26
Neuralgia	174
Nipples	95
Nitric acid, antidote for	294
Nursing	102
Oozing	206
Opium, laudanum, morphine, and heroin poisoning	294
Ordinary bleeding	205
Packing a wound to check hemorrhage	206
Painter's colic	167
Palpitation	161
Paris green, antidote for	295
Pasteurization of milk	90
Pellagra	75
Perforating wounds of the chest	198
Permanent splints	248
Personal hygiene	74
Piles	169
Plague	144
Plaster of Paris casts	250
Plasters	232
Pleurisy	160
Plumbing	40
Pneumonia	110
Poisons	291
Poison ivy	175
Poisoned wounds	200
Poisoning	291
Poisoning from illuminating gas	22
Pork tapeworm (Tænia solium)	149
Pott's fracture	266
Prenatal care	100
Preparation of bed	102
Preventable blindness	177
Prevention of disease	17
Privies	41
Proper method of milking	76
Provisional tourniquets	210
Ptomaine poisoning	296
Pulse	103
Punctured wounds	183
Rabies, symptoms of	203
Rat guards	66
Rat proofing of buildings	18
Rats on vessels	64
Recurrent bandage	225
Relative humidity	23
Rescue of drowning persons	279
Respirations	108
Respirators	27
Resuscitation from electric shock	282
Resuscitation from gas poisoning	285
Retention of urine	156
Rheumatic fever	116
Rheumatism	115
Riggs' disease	81
Roaches	60
Roller bandage	222
Roundworm (Ascaris lumbricoides)	149
Rupture	238
Sanitation of buildings	17
Sanitation of vessels	61
Scalp wounds	199
Scarlet fever	125
Schaefer method of artificial respiration	277
Screening of buildings	18
Scurvy	147
Seatworm (Oxyuris vermicularis)	150
Selection of a camp site	68
Setting a bone	250
Setting-up exercises	79
Sewage disposal	39
Sewing up a wound	193

	Page.
Shallow wells	34
Shock	220
Sick room	103
Simple fracture	246
Sleep, infants'	97
Sleeping outdoors	132
Sling psychrometer	23
Small cuts	191
Smallpox	118
Snake bites	200
Soft chancre (chancroid)	153
Sore eyes	177
Sore mouth	162
Sore throat (tonsillitis, quinsy)	163
Special poisons	292
Spiral reversed bandage	223
Splinters	198
Spotted fever (cerebrospinal meningitis)	140
Sprains	240
Springs	39
Standard for drinking water	32
Sterile dressings	185
Sterilization of the hands	184
Sterilization of milk	91
Stings of centipedes, tarantulas, and scorpions	202
Stoves	28
Strained or lame back	234
Strains	234
Strangulated hernia	289
Strangulation and hanging	285
Stricture of the urethra	156
Strong acids, such as muriatic acid, nitric acid, or sulphuric acid; poisoning	294
Strychnine poisoning	296
Suffocation	276
Sulphur fumigation	65
Sunburn	269
Sunstroke	172
Sunstroke and heat exhaustion	273, 291
Suppression of flies	72
Sweeping	49
Symptoms of childbirth	84
Symptoms of fracture	246
Symptoms of wounds	184
Syphilitic rheumatism	118
Syphilis	151
T-bandage	230
Tapeworms	147
Temperature of body	103
Tetanus	196
Ticks	60
Tincture of iodine poisoning	295
Tourniquets	208
Trachoma	178
Transmission of disease by insects	50
Transportation of the injured	301
Treatment of sewage	39
Triangular bandage	227
Tying arteries	213
Typhoid fever	104
Typhoid prophylaxis	106
Typhus fever	107
Unconsciousness	285
Vaccination	120
Vaccination of children	100
Varieties of fracture	245
Varieties of wounds	183
Venous hemorrhage	206
Venereal warts	155
Ventilation	23
Ventilation of buildings	26
Ventilation of vessels	62
Vitamines	75
Washing of woolen garments	80
Water for vessels	63
Water carriage system of sewerage	39
Water filters	32
Water gas	22
Water supply	30
Water supply of buildings	30
Water supply for camps	70
Weaning	89
Weighing the baby	98
Well bucket	38
Welsbach lights	23
White damp	22
Whooping cough	127
Wounds	181
Wounds of the abdomen	199
Wcunds of the brain	290
Wounds caused by fishhooks	198
X-rays of fractures	247
Yellow fever	137